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Cytology and Genetics of Barley ..... LUTHER SMITH 285

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THE BOTANICAL REVIEW

VOL. XVII MAY, 1951 No. 5

GENETICS AND CYTOLOGY OF BARLEY

(Concluded from March Issue)

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SUMMARY

It is left only to summarize this review because it is hoped that the literature has been summarized with reasonable adequacy in the preceding pages. The aim has been to see barley literature not only from the viewpoint of the geneticist and cytologist but also from the standpoint of the plant breeder, agronomist and farmer. In a review of this kind it has been necessary to pass over with only a few words, observations that have filled scores of pages of print. Nor has it been possible to eulogize specifically certain outstanding barley workers. However, this review would not be complete without paying tribute to probably the greatest "Barley Man" of them all—the late Dr. H. V. Harlan. One thing is sure, if it had not been for the inspiration of this outstanding scholar, teacher, scientist, friend and wit, there would not have been the interest in barley necessary to justify the time that has been devoted to this review. It is hoped that this paper will in a small way supplement his posthumously published book, One Man's Life with Barley (315), which I have been privileged to read in advance of publication. If this review can add only a little

detail to his remarkable summary of the available knowledge of the plant and further emphasize his emphasis of how little is really known, the author will be well satisfied and well repaid. "Doc's" book was read when this manuscript was nearing completion. The reading left a sense of helplessness and awe because he had so deftly laid open the lifetime of work and the heart of a great man. The book not only provides a tremendous storehouse of information on and experience with barley, but also gives a philosophy of living and working that would be difficult to improve upon. The book probably will never be a best-seller, but few books are packed with more humor, wisdom and information—not only about barley and his breeding of, and world-wide search for, better barleys, but also about many other, more personal, subjects. The reader of One Man's Life with Barley will find details in which he will disagree with Doc (as a matter of fact, Doc apparently disagreed with himself at times and would not want to be agreed with on every point), but few books are so enjoyably stimulating to thought and to research.

ACKNOWLEDGMENTS

To acknowledge all indebtednesses for help in the preparation of this paper would require considerable space. However, in a task of this kind it is a foregone conclusion that the reviewer has had more or less assistance, as well as inspiration, from colleagues and fellow workers. The writer is grateful to those who made available unpublished observations, theses, abstracts and reprints of their publications. Special thanks are tendered Drs. H. C. Aase, W. H. Leonard, D. W. Robertson and G. A. Wiebe for various sorts of help; to Mary Hirakawa and the Bibliofilm Service of the U. S. Department of Agriculture Library for painstakingly finding and preparing films and photostatic copies of articles not available in the original. A number of people helped with articles published in various foreign languages: Hans Gunthardt: German, French, Italian; Dean E. C. Johnson: Swedish, Danish; Dr. and Mrs. Igor Kosin and John Unrau: Russian; Stefan Krazewski: Polish; T. Kurahashi, C. C. Moh, J. Y. Park and H. W. Wang: Japanese. To those unsung heroes, the stenographers and library workers, a personal bouquet.

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TABLE 1

SPECIES OF BARLEY AND THEIR HAPLOID CHROMOSOME NUMBERS

Species	Chromosome No.	Authority[1]
SECTION I. STENOSTACKYS NEVSKI		
H. Bogadanii Wilensky	....	...
H. brevisubulatum (Trin.) Link.	....	....
H. secalinum var. *brevisubulatum* Trin.	....	....
H. californicum Covas et Stebbins	7	129, 750
H. nodosum L.		
H. jubatum L.	7	750
	14	4, 23, 43, 129, 277, 349, 418, 604, 747, 750
H. jubatum L. var. *caespitosum* Scribn.		
H. caespitosum Scribn.	7	790
H. adscendens H.B.K.		
H. nodosum L.	7	790
	7, 14	129, 349, 750
	21	277
H. pratense Huds.		
H. secalinum Schreb.	7	129, 441, 790
	14	254, 255, 256, 258, 494, 747
H. pratense var. *nodosum* Griseb.		
H. nodosum var. *boreale* (Scribn. et Smith) Hitch.		
H. boreale Scribn. et Smith		
H. brachyantherum Nevski	14	129, 750
H. sibericum Roshev.		
H. stenostachys Godron	7	604, Covas 1950bA
H. turkestanicum Nevski		
H. violaceum Boiss. et Huet.		
SECTION II. HORDEASTRUM DOLL		
H. arizonicum Covas		
H. adscendens H.B.K.		
H. jubatum var. *caespitosum* Scribn.		
H. depressum Rydb.	14	144
H. nodosum var. *depressum* Scribn. et Smith		
H. gussoneanum Parl.		
H. gussoneanum Parl.	14	129, 790
H. maritimum var. *gussoneanum* Richt.		
H. marinum Subsp. *gussoneanum* Thell.		
H. depressum Rydb.		

[1]For the chromosome counts, not necessarily for the taxonomic classification.

TABLE 1 (*continued*)

Species	Chromosome No.	Authority[1]
H. hystrix Roth.	7	144
	14	129
H. gussoneanum Parl.		
H. maritimum With.	7	254, 255, 256, 277, 790
H. marinum Huds.	7	258, 277, 494
H. maritimum With.		
H. montanense Scribn.		
H. pammeli Scribn.		
H. murinum L.	7	256, 258, 604, 755, 790
	14	4, 23, 129, 277, 747
	7, 14	349
H. ciliatum Gilib.		
H. murinum L. subsp. *leporinum*		
H. leporinum Link.	7	23, 604
H. ambiguum Doell.		
H. murinum Griseb.		
H. Stebbinsis Covas	7	144
H. murinum L.		
H. murinum L. var. *pedicellatum*		
H. pusillum Nutt.	7	23, 129, 441, 604
H. riehlii Steud.		
H. secalinum Schreb.	7	129, 441, 790
	14	254, 255, 256, 494, 747
SECTION III. BULBOHORDEUM NEVSKI		
H. bulbosum L.	7	256, 478
	14	59, 129, 254, 255, 258, 467, 468, 478, 747
SECTION IV. CEREALIA ANDS.		
H. agriocrithon E. Aberg	7	5, 6
H. spontaneum C. Koch	7	4, 26, 129, 254, 277, 755, 790, 845, Covas 1950aA
H. Ithaburense Boiss.		
H. vulgare L. emend. Lam.	7	4, 129, 173, 174, 253, 254, 255, 256, 276, 277, 351, 409, 423,

TABLE 1 (*continued*)

Species	Chromosome No.	Authority[1]
H. vulgare L. emend. Lam. (*continued*)		441, 491, 553, 561, 608, 609, 610, 664, 686, 725, 726, Covas 1950aA
H. coeleste L.		770, 790, 845
H. cornutum Hort. Vilmorin	7	253, 254, 255, 256, 258
H. hexastichon L.	7	253, 254, 255, 256, 331, 441, 845
	14	423
H. hexasticofurcatum		
H. intermedium (Kcke.) Carleton	7	129, 276, 277, 790
H. nigrum Willd.	7	253, 254, 255, 256, 258
	7	395, 396, 397, 467, 468, 569
H. polystichum Doll.		
H. sativum Pers.		
H. tetrastichum Kcke.	7	253, 254, 255, 256
H. trifurcatum Wender	7	129
H. cucullatum Koern.		
H. Horsfordianum Wittn.		
H. irregulare E. Aberg et Wiebe		
H. distichum L. emend. Lam.	7	170, 174, 252, 253, 254, 255, 256, 258, 276, 277, 441, 491, 501, 747, 755
H. aestivum Hall.		
H. distichon L.	7	129, 276, 277, 331, 418, 430, 569, 790
H. deficiens Steud.	7	129, 174, 276, 277, 790
H. erectum Schubl.	7	253, 254, 255, 256, 258
H. inerme		
H. nutans Schubl.	7	747
H. nudum	7	253, 255, 256
H. sativum Pers.		
H. zeocriton L.	7	129, 253, 254, 255, 256, 755, 902

TABLE 1 (*continued*)

Species	Chromosome No.	Authority[1]
SPECIES THAT COULD NOT BE ASSIGNED TO THE FOUR SECTIONS		
H. andicola Griseb.		
H. canadense H. et C.	14	747
H. caput medusae Coss.	7	277, 747
H. chilense Brongn.	7	23
H. comosum Presl.		
H. compressum Gris.	7	604, Covas 1950bA
H. euclaston Steud.	7	23
H. europaem All.		
H. muticum Presl.		
H. nudiramulosum Hort. Vilmorin	7	253, 254, 255, 256, 258
H. pavisi Preaub.	7	494
H. pubiflorum Hook.		
H. silvaticum Huds.	14	747
H. thyrosoideum Hort. Vilmorin	7	253, 254, 255, 256, 258

TABLE 2

MUTANTS IN BARLEY[1]

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
			Seedling Chlorophyll Mutants			
Albescent	....	....	...	1	....	361, 362
Albino	....	sev.	691	15	....	139, 305, 310, 421
	6	....	709	...	....	521, 580, 660, 827, 859
	....	1,500	297, 334, 731a,	....	....	888
	....	....	732, 744, 745	....	1	602
	....	3	611 (heat)	....	....	....
Banded shrivel	....	100	297, 334, 731a, 732, 744, 745	....	....	...
Chlorina	1	....	611 (heat)	1	....	670
Super chlorina	....	....	....	....	1	305
Light green[1]**	...	....	....	....	....	436, 439
Light yellow	....	....	....	1	....	547
Lutescens	....	....	....	2	....	305
Striping	....	3	501, 744, 759	....	3	440, 736
	....	....	....	....	sev.	514
	....	....	....	1	....	440
Virescent	....	88	744, 745, 759	3	....	305
	....	1	611 (heat)	....	....	....
Whitish**	....	....	...	....	....	R. C. Shands, Unpub.

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Xantha	1	1	583	3	....	583, 660, 669
	....	200	297, 334, 731a, 732, 744, 745	....	....	....
	1	....	611 (heat)	....	....	....
Yellow green	....	Sev. hundred	297, 334, 731a, 732, 744, 745	....	1	580
			Miscellaneous Seedling Mutants			
Anthocyanless leaves	....	...	....	....	1	580
Glossy seedling	2	....	391, 669	....	....	....
Golden (viable chlorina)	....	....	....	....	?	848
Leek-like	....	....	....	....	1	383
Maternal light green	....	....	....	....	1	664
Maternal variegated	....	....	....	....	1	33, 385
Mottled leaf	....	2	759	....	....	....
"Vine"	....	5	L. Smith, Unpub.	....	....	315
			Spike Mutants			
Accordion rachis	....	....	....	....	1	514
Awnless	....	2	453, 454, 612	....	....	....
"Brushy" awn	....	2	759	....	....	....

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Branched spike	1	1	232, 501	1	....	90, 837
Bristle spikelet	....	....	....	....	1	158
Brittle spike	....	2	232	....	....	....
Broad glumes	....	....	....	....	1	538
Broad outer glume	....	....	....	....	1	89
Calcaroid lemma	....	1	287, 297	....	....	....
Dense ears**	....	....	297	....	....	....
Dense ears (including erectoids)	....	51	232, 297, 583, 453, 456, 612, 759	....	4	158, 339, 625
Double flowers	1	....	298	....	....	....
Double-grained florets	....	....	....	....	?	848
Elevated hoods	....	....	....	....	1	514
Fan-shaped spike	....	2	759	....	....	....
Fourteen-row	....	....	....	....	1	514
Fragile awn	....	3	759	....	?	848
Golden palet	....	....	....	....	....	848
Half-naked kernels	....	1	351	....	....	....
Hooded*	....	....	....	....	....	314
Horizontal Spike[3]	....	1	759	....	....	....
Intermedium-like**	....	....	297	....	....	380
Intermedium-like	....	2	232, 297	....	....	380
Kernel nick	....	....	....	....	1	807
Large Kernels	....	1	286, 289	....	....	....

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Lax ears	....	....	....	....	2	158
Lemma-like glumes	1	2	297, 298, 453, 612	....	....	....
Macroglume	....	2	232, 759	....	....	....
Multiflorous	....	4	232, 759	....	1	514
Opposite florets[3] Orange	....	4	232	....	1	G. A. Wiebe, Unpub.
Pompom	....	....	....	....	sev.	514
Ramified ear	....	....	....	....	?	848
Rattail ear	....	....	....	....	1	G. A. Wiebe, Unpub.
Short awns	....	7	232, 297, 759	....	1	158
Six-row	....	3	286, 288, 289, 297	....	....	....
Smooth awns	....	....	....	....	1	535
	....	....	....	sev.	....	312
Sub-sessile hoods	....	....	....	....	1	514
Third outer glume	....	....	....	1	....	401
Triaristata	....	....	....	....	1	157
Triple-awned lemma	....	....	....	....	1	514
Tweaky	....	....	....	....	....	G. A. Wiebe, Unpub.
Tubular ears[3]	....	1	612	....	....	....
Variable kernel rows[3]	....	4	759	....	....	....

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Watery seeds	....	....	....	....	1	315 ....
White chaff (from black)	....	....	....	....	2	649
Whitish spike[3]	....	1	759	....	....	....
Zeocriton-like ear	....	....	....	....	2	863
Mature Plant Morphological Mutants Other Than Spike Characters						
Augustifolia**	....	....	....	....	....	G. A. Wiebe, Unpub.
Brachytic	....	....	....	1	....	770
Brittle straw	....	....	....	1	....	848 (Takahashi et al. 1950A)
Collared neck[3]	....	....	....	1	....	543
Crooked neck[3]	....	1	297	....	....	....
Curled neck	....	2	453, 612	....	....	....
Dwarf*	....	....	....	....	....	545
Dwarf	1	....	501	5	....	304, 305, 694, 703, 860, 861
	....	sev.	691	....	....	....
	....	2	759	....	3	369, 370, 861
	1	....	611 (heat)	....	....	....
Liguleless	1	....	499	1	....	848 (Takahashi et al. 1950A)
Many noded dwarf	....	....	....	3	....	58, 322, 365
Many internodes	....	....	....	1	....	58
Many tillers[3]	1	....	455	....	....	....

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Narrow leaf	....	2	759	....	....	....
Pubescence*	....	....	....	....	....	375
Stiff straw	....	2	289	1	....	862
Tillering reduced	....	6	232	....	....	....
Tubular leaves	....	1	453	....	....	....
Uniculm[3]	....	1	795	....	....	514
			Miscellaneous Mature Plant Mutants			
Bloomless	....	7	232, 744, 795, 297	1	....	828
	4	....	....	....	4	848
Defective	1	20	232, 455	....	....	....
Grandpa	....	....	....	....	sev.	514
Persistent chlorophyll	....	1	232	....	....	....
Scirpoides	....	....	....	1?	....	297
Yellowish-brown kernel	....	1	286	....	....	....
			Mature Plant Physiology Mutants			
Early	....	18	74, 232, 289, 612	....	1	158
Large heading	....	2	286, 289, 501	....	1	158
Mildew resistant	....	sev.	228, 232	....	....	....
Mildew susceptible	?	2	232	....	....	....
Ring speckle disease	....	....	....	1	....	848

TABLE 2 (*continued*)

Character	Induced			Spontaneous		
	Recessive	Unknown	Authority	Recessive	Unknown	Authority
Various	....	13	297	....	....	....
Winter habit	....	1	744	....	....	....
	....	29	286	....	....	....
			Mature Plant Sterility Mutants			
Desynapsis	1	....	117, 522	1	....	170
Male Sterile	....	....	....	2	....	42, 764 (G. A. Wiebe, Unpub.)
Multiploid spores	....	....	....	1	....	726
Spikelet abortion	1	....	501	....	....	....
Sterility, partial*	....	....	....	....	....	365
Sterility, complete	....	....	....	....	?	848

[1]This list represents most of the reported cases of mutations, either induced (mainly resulting from X-radiation, but including a number resulting from other irradiations and from heat treatment), or spontaneous. Only a few dominant (asterisk) or partially dominant (double asterisk) mutants have been recorded. The numbers of mutants in irradiation studies are not accurate but are indicative of the large numbers.

[2]One of a complex of characters. In many cases a gene produces a whole complex of changes. For example, some genes for white seedlings do not appreciably alter the size of the first one or two leaves. Other genes produce white seedlings which are dwarfish; still others modify the length-breadth ratio of the leaves. Some white seedling mutants have been shown to have different biochemical activities. Certain early mutants may also be lighter or darker green; some light- or yellow-green mutants may have off-type spikes or vegetative irregularities, etc. For simplicity and brevity, an effort has been made to apply a name to a mutant that points out its outstanding characteristic. Also, in dealing with foreign names, sometimes the writer designated mutants with names more familiar and more descriptive to readers of English. In a few cases it was not possible to make such a free translation, and the foreign name was left unchanged.

[3]Present writer's terminology.

*Dominant.

**Intermediate (partially dominant).

TABLE 3

ALPHABETICAL LIST OF BARLEY GENES[1]

Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
a	....	Albino seedling	.....	I	146
a2	a1	Albino seedling	....	....	306, 582
a3	a2	Albino seedling	....	....	306, 582
a4	a3	Albino seedling	....	I	306, 582
a5	a4	Albino seedling	....	I	306
a_b	....	Albino seedling	....	V	662
a_c	....	Albino seedling	....	VI	521, 660
a_{c2}	....	Albino seedling	....	III	665, 670
a_{c3}	....	Albino seedling	....	....	667
a_h	....	Albino seedling	....	....	662
a_n	....	Albino seedling	....	VI	665
a_t	....	Albino seedling	....	II	660
a_{t2}	....	Albino seedling	....	....	662
a_{t3}	....	Albino seedling	....	....	115, 139
B	....	Black lemma and caryopsis	1	II	115, 146, 338, 370, 401, 521, 638, 660, 896
B^g	....	Gray lemma and caryopsis	1	II	896
B^{mb}	....	Medium black lemma and caryopsis	1	II	897

[1]This is a list of the barley genes that have been reported, taken primarily from the lists of Robertson et al. (676, 677). In some cases new gene symbols are used which are in closer conformity with current practices in designating gene loci. The new symbols were approved by the Committee on Nomenclature. The symbols previously used (676, 677, or in a few cases in original publications) are given in the second column. The 4th column gives the number under which the character is treated in the text discussion. The 5th column lists the linkage group(s) in which the gene has been located. Where more than one linkage group is listed, there is evidence of more than one gene for the character, or there is disagreement as to the location of the gene. Investigators (not necessarily all—See text discussions) who have studied the character and/or contributed toward the determination of its linkage relations are cited in the last column. For further information on the linkage tests, see Figs. 2 to 8.

Data of Takahashi et al. (1950A), received too late for reporting in detail, give information on three additional gene pairs. A gene al for ligule-less was located in Group 1 with a crossover value of about 38% with v. A gene fs for fragile stem was located in Group 5 about 20 to 26 units from S and about 39 units from R. A gene uz for semi-brachytic (543, 736, 777, 788) was located about five crossover units from a_c and 17 units from a_n in Group 6.

TABLE 3 (*continued*)

Gene symbol	Previous symbol	Character: Name	Character: No. in text	Linkage group	Authority (ies)
be	Nb	Branched ear (duplicate factors)	28	....	90, 373, 831
be2	Nb1	....	28	....	...
Bl	....	Blue aleurone (complementary factor)	8	IV	115, 565, 672
Bl2	...	Blue aleurone (complementary factor)	8	III	115, 565, 672
br	...	Brachytic	41	VII	107, 638, 770, 878
Bt	....	Brittle rachis	18	II	410, 844
Bt2	...	Brittle rachis	18	....	410, 844
Bt3	...	Brittle rachis	18	...	119, 698, 834
cr	...	Curved peduncle	40	....	115, 503
D	...	Dwarf (sterile)	41	....	545
da	lk_u	Dehiscent awn	16	I	373, 796
da2	...	Dehiscent awn	16	...	799
e	...	Elongated (awned) outer glume	15	I	91, 370
e2	....	Fine awned outer glume	15	...	149
Ea	....	Early maturity (several factors)	46	I	49, 276, 572, 885
Ea2	....	....	....	IV	801
Ea3	...	....	....	V	885, 893
er	....	Erectum base on grain (complementary factors)	20	....	807
er2	er1	Erectum base on grain (complementary factors)	20	..	807
f	....	Chlorina seedling	....	I ..	107, 306, 582, 672
f3	...	Chlorina seedling	....	....	391
f_c	...	Chlorina seedling	....	VII	670, 733, 878
f_{c2}	....	Chlorina seedling	....	...	664
G	...	Teeth on lemma	34	I	885
....	....	....	...	III	854
G2	....	Teeth on lemma	34	....	372, 373
ge	....	Glaucous ear	38	...	677
Gh	....	Glumes, hairy	21	....	149, 370, 868
gl	...	Glossy seedling	....	IV	391, 676
gl2	...	Glossy seedling	....	IV	676
gp	....	Grandpa	....	....	391

TABLE 3 (*continued*)

Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
Gr	....	Growth factors	....	VI	667
Gs	....	Glaucous sheath	38	....	391
H	....	High (tall)	52	I, III	437, 470, 543, 572, 638, 773, 806, 877
H2	....	High (tall)	52	V	877
Hl	....	High (tall), modifying factor	52	....	773, 877
hg	....	Susceptibility to *Helminthosporium gramineum*	73	....	34, 35
hg2	....	Susceptibility to *H. gramineum*	73	....	34
hg3	....	Susceptibility to *H. gramineum*	73	....	34, 398
Hl	....	Susceptibility to *H. sativum*	61	I	36, 276
Hl2	....	Susceptibility to *H. sativum*	61	II	276
Hl3	....	Susceptibility to *H. sativum*	61	V	276
Hr	....	Hairy rachis	22	I	149, 240
Hr2	....	Hairy rachis	22	V	149, 240
Hr3	....	Hairy rachis	22	....	149
Hs	....	Hairy leaf sheath	45	....	374, 786
I	....	Infertile intermedium	23	IV	115, 260, 572, 660, 842, 898, 899
I^h	....	Fertile intermedium	23	IV	317, 482, 483, 898, 899
I_I	....	Third factor for fertility of the lateral floret	23	....	260
j	....	Complementary factors inhibiting red pericarp color	10	....	115
j2	j1	Complementary factors inhibiting red pericarp color	10	....	115
K	....	Hooded	17	IV	115, 146, 150, 262, 338, 370, 401, 527, 543, 660, 844

TABLE 3 (*continued*)

Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
kl	...	Long awned	14	III	543, 844, 846
kl2	kl1	Long awned	14	....	543
kw	....	Kernel weight	53	I	49
	...	(multiple factors)	...	VII	480
L	....	Lax spike	24	I, III, IV	572, 736, 845
L2	l1	Lax spike	24	III	543, 736, 884
L3	l2	Lax spike	24	III	543, 736
	...	....	...	V	884
L4	l3	Lax spike	24	...	885
L5	l4	Lax spike	24	I	885
L6	l5	Lax spike	24	....	885
La	...	Lax spike	24	III	877
Lb	Bi	Long basal internode	25	V	345
lc	....	Long chromosomes	.	III	117, 522
lg	..	Light green seedling	..	I	391 (S. P. Swenson, Unpub. data)
lg2	...	Light green seedling	...	IV	391
lg3	...	Light green seedling	..	IV	308, 391
lg4	...	Light green seedling	..	IV	391
lk	..	Length of awn	14	I, III	78, 176, 177, 464, 543, 564, 737
lk2	lk1	Series of factors for awn length	14	I, III	176, 543
lk3	lk2	....	14	....	378, 846
lk4	lk3	....	14	....	127, 737
Log	...	Long outer glume	26	I	571, 572
log2	...	Long outer glume	26	....	571, 572
lp	...	Lethal progeny (complementary factors)	...	....	889
lp2	lp1	....	...	...	...
lr	...	Lateral spikelet appendage on lemma reduced	...	I	262, 482, 543
m	...	Many noded dwarf	41	....	322
Ml_a	...	Susceptibility to mildew	63	II	100, 222, 818, 819, 820

TABLE 3 (*continued*)

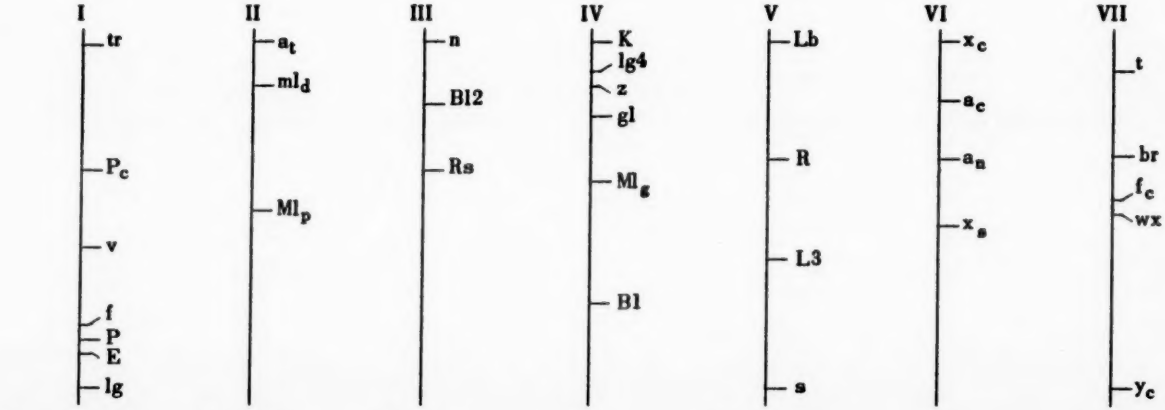
Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
Ml_b	....	Susceptibility to mildew	63	II	222
Ml_c	....	Susceptibility to mildew	63	II	222
ml_d	....	Susceptibility to mildew	63	II	748
Ml_g	Er_{cp}	Susceptibility to mildew	63	IV	99, 233
Ml_h	....	Susceptibility to mildew	63	....	99
Ml_k	....	Susceptibility to mildew	63	II	100, 222
Ml_m	....	Susceptibility to mildew	63	II	222
ml_n	....	Susceptibility to mildew	63	....	222
Ml_p	....	Susceptibility to mildew	63	II	748
ml_w	....	Susceptibility to mildew	63	....	222
Ml_y	....	Susceptibility to mildew	63	....	748
ms	....	Male sterile	....	....	764
ms2	....	Male sterile	....	I	42 (G. A. Wiebe, Unpub.)
mu	....	Multiploid sporocytes	....	....	726
n	....	Naked	27	III	115, 146, 338, 370, 401, 543, 571, 660
o	....	Orange lemma	3	V	115, 391, 401, 543, 565, 794
or	....	Orange seedling	....	I	668
P	....	Purple lemma	4	I	115, 146
P2	P1	Purple lemma	4	....	543
P3	P2	Purple lemma	4	....	543
P_c	....	Purple veined lemma	5	I	115
P_e	....	Purple veined lemma	5	....	115
P_f	....	Purple veined lemma	5	....	115
pa	....	Susceptibility to *Puccinia anomola*	64	I	368, 677, 874

TABLE 3 (*continued*)

Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
pa2	....	Susceptibility to *Puccinia anomala*	64	....	876
Pbg	....	Pubescence on outer glume	21	III	370
Pr	....	Purple straw	12	I	663
R	....	Rough awn	30	V	146, 150, 240, 276, 370, 521, 532, 672, 716, 733, 885
R2	R1	Rough awn	30	...	150, 235, 276, 672, 716
R3	R2	Rough awn	30	...	150, 235
R4	R3	Rough awn	30	III	854
ra	....	Rachilla short	31	V	57
ra2	....	Rachilla short	31	....	57
ra3	....	Rachilla short	31	...	57
rb	....	Ribbon grass (streaked leaves)	....	...	677
Re	....	Red pericarp	10	V	115
Re2	R1	Red pericarp	10	I	115
rin	....	Rachis internode number	32	I	773, 795
rin2	....	Rachis internode number	32	IV	233
Rs	....	Red stem	13	III	101
rt	....	Rattail spike	....	...	677
s	....	Short rachilla hairs	33	V	115, 146, 240, 370, 401, 521, 660, 716, 733, 885
sc	....	Susceptibility to Fusarium scab	68	...	677
Sh	....	Spring habit of growth	50	V	234, 345, 532
Sh2	...	Spring habit of growth	50	...	234, 266, 267
Sh3	...	Spring habit of growth	50	...	345, 571, 572
t	...	Susceptibility to *P. graminis tritici*	66	VII	107, 639, 733, 878
tr	...	Triple awned lemma	....	I	391
trd	....	Third outer glume	....	II	401
tw	...	Tweaky	....	I	11 (D. W. Robertson, Unpub.)
U	....	Unbranched styles	35	....	670, 672

TABLE 3 (*continued*)

Gene symbol	Previous symbol	Character		Linkage group	Authority (ies)
		Name	No. in text		
U2	U1	Unbranched styles	35	....	670, 672
U3	U2	Unbranched styles	35	....	670, 672
uh	....	Susceptibility to *U. hordei*	71	....	642, 677
un	....	Susceptibility to *U. nuda*	72	VII	495, 693, 712
un2	....	Susceptibility to *U. nuda* (minor factor)	72	....	495, 568
un3	....	Susceptibility to *U. nuda*	72	....	693
un4	....	Susceptibility to *U. nuda*	72	....	693
un5	....	Susceptibility to *U. nuda*	....	....	693
v	....	Six-rowed	23	I	146, 260, 276, 317, 338, 370, 401, 572, 660, 842
V^t	....	Allele for *deficiens*	23	I	806
V^d	....	Two-rowed	23	I	899
V	....	Two-rowed	23	I	899
w	....	Wide glumes	36	I	370, 401
Wh	....	Waxy bloom on head	38	....	401
Wh2	Wh1	Waxy bloom on head and stem	38	....	401
wi	....	Wide glume inhibitor	....	....	370
Wl	....	Waxy bloom on leaves	38	....	828
Ws	....	Weakly (attached) spikelet	18	....	800
wx	....	Waxy endosperm	49	VII	42, 308, 878 (G. A. Wiebe and R. G. Shands, Unpub.)
x	....	Xantha seedling	....	....	582
x_c	....	Xantha seedling	....	VI	660
x_{c2}	....	Xantha seedling	....	....	670
x_n	....	Xantha seedling	....	....	663
x_s	....	Xantha seedling	....	VI	665
y	....	Virescent seedling	....	I	306, 582, 668
y^x	....	Virescent seedling (allele of y)	....	I	669
y_c	....	Virescent seedling	....	VII	670
z	....	Zoned leaf	....	IV	391



a	L	Pr	B	Ml_c	a_{c2}	L_a	Ea2	a_b	o	Gr	kw
a4	L5	Re2	Bt	Ml_k	G	lc	gl2	b	ra	uz	un
a5	lk	rin	Hl2	Ml_m	H	lk	i	ea	Re		
da	lk2	tw	Ml_b	trd	kl	lk_2	L	H2	Sh		
Ea	log	w			L	Pbg	lg_3	Hl3	fs		
G	lr	y			L2	R4	lg_3	Hr2			
H	Ml_a	y^x			L3		rin_2				
Hl	ms_2	al									
Hr	or										
Kw	pa										

FIG. 1. Linkage Groups in Barley. The orders and percentages of recombination of genes shown on the graphs have been fairly definitely established. Other genes that have been found to be associated with the various groups are listed below their respective graph. In a number of cases, the orders of various combinations of three or four genes have also been determined. However, data were insufficient for placing them on the graphs. For additional detail on crossover percentages, see Figs. 2 to 8. (One-half inch represents about 15 crossover units.)

Linkage Group I

	a	a4	a5	da	E	Ea	f	G	H	Hl	L	L5	lg	lk	lk2
a															
a4			13; 306				7; 306 582								
a5							4; 306								
da															
E							3; 673		8; 773				4; 391		
Ea										0; 276					
f										0; 276			12;*	28; 673	
G															
H															
Hl															
L															
L5															
lg															
lk															
lk2															

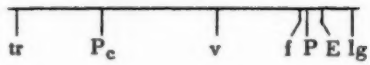


FIG. 2. A chart summarizing the data on linkage studies in Group 1. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

* S. P. Swenson, Unpub.

Linkage Group I (*continued*)

	log	lr	or	P	P_c	Pr	Re2	rin	tr	v	w	y	y^x
a										27; 146			
a3													
a4													
da										16; 796			
E			15; 673					15; 773	41; 391	27; 91			
										391, 673			
										773.			
Ea										42; 276			
f			9; 668							18; 672		1; 668	2; 669
G										16; 843	14–41; 427		
										885			
H								13; 773		25; 773			
Hl										0; 276			
L										0; 572			
L5										40; 885			
lg									52; 391	31; 391,*		2; 391,*	
lk										0; 676		27; 673	
lk2													
	log									0; 572			
		lr	33; 482							0; 482			
			or							31; 668		13; 668	15; 669
				P	34; 115		.5; 115			17; 115			
										565			
					P_c		34; 115			22; 115			
						Pr				9; 663			
							Re2			19; 115			
								rin		25; 773			
										795			
									tr	39; 391			
										v	40; 370	31; 668	31; 669
											w		
												y	
													y^x

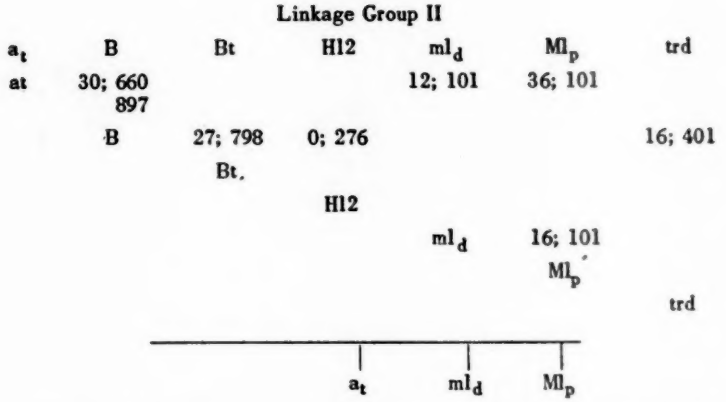


FIG. 3. A chart summarizing the data on linkage studies in Group II. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

Linkage Group III

a_{c2}	Bl2	H	kl	L	L2	l3	L_a	lk	n	Pbg	R_4	Rs
a_{c2}									27; 665 10; 565			9; 101
	Bl2											
		H							11; 470			
			kl						14; 845			
				L	12; 736	18; 736			17; 736 845			
					L2	25; 736			13; 543 736			
						l3			23; 543 736			
							L_a		40; 878			
								lk	543*			
									n	25; 370	854*	15; 101
										Pbg		
n	Bl2	Rs									R_4	
												Rs

FIG. 4. A chart summarizing the data on linkage studies in Group III. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

*No specific crossover value given.

Linkage Group IV

Bl	Ea2	gl	gl2	i	K	L	lg2	lg4	Ml_g	rin2	z
Bl		36; 391			33; 115 391, 565 672.				26; 101		
	Ea2				20; 801						
		gl			10; 391			4; 391			3; 391
			gl2	28; 669	15; 669						
				i	15; 426 482 661 663						
					K	18; 845 L	2; 391 lg2	5; 391 lg4	19; 101 Mlg	233* rin2	6; 391 z
											1; 391

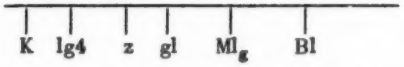


FIG. 5. A chart summarizing the data on linkage studies in Group IV. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

* No specific crossover value given.

Linkage Group V

a_b	Ea	Hl	Hr2	L3	Lb	o	R	ra	Re	s	Sh
a_b										26; 665	
	Ea						0; 885				
		Hl					0; 276				
			Hr2				0; 240			23; 240	
				L3	38; 345		22; 345 884				
					Lb		16; 345			40; 345	
						o				39; 115	
							R			33; 146 240 370, 498 521, 669 716, 733 885	0; 532
								ra		0; 57	
									Re	35; 115	
										s	

Lb — R — L3 — s — Sh

FIG. 6. A chart summarizing the data on linkage studies in Group V. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

Linkage Group VI

a_c	a_n	x_c	x_s
a_c		9; 660	25; 665
	a_n	9; 665	16; 665

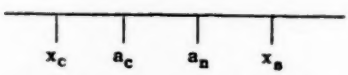


FIG. 7. A chart summarizing the data on linkage studies in Group VI. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

Linkage Group VII

br	f_c	kw	t	un	wx	y_c
br	10; 107 770		13; 107		18; 878	34; 391
	f_c		17; 107 733		1.5; 878	31; 391 661 672
		kw	0; 480			
			t	0; 712	17; 878	60; 391
				un		
					wx	
						y_c

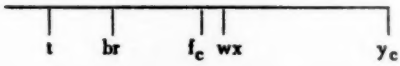


FIG. 8. A chart summarizing the data on linkage studies in Group VII. In the chart the first figure indicates the recombination value, and the second, the publication in the Bibliography.

BIBLIOGRAPHY [1]

1. AAMODT, O. S. and JOHNSON, W. H. Reaction of barley varieties to infection with covered smut (*Ustilago hordei* Pers. K. & S.). Canad. Jour. Res. C. **12:** 590–613. 1935.
2. AASE, H. C. Cytology of cereals. Bot. Rev. **1:** 467–496. 1935.
3. ————. Cytology of cereals. II. Bot. Rev. **12:** 255–334. 1946.
4. ———— and POWERS, L. Chromosome numbers in crop plants. Am. Jour. Bot. **13:** 367–372. 1926.
5. ÅBERG, E. *Hordeum agriocrithon*, a wild six-rowed barley. Chron. Bot. **4:** 390. 1938.
6. ————. *Hordeum agriocrithon* nova sp., a wild six-rowed barley. Ann. Agr. Coll. Sweden **6:** 159–216. 1938.
7. ————. The taxonomy and phylogeny of *Hordeum* L. Sect. *Cerealia* Ands., with special reference to Tibetan barleys. Symbol. Bot. Uppsala **4:** 1–156. 1940.
8. ———— and DENWARD, T. Abnormal spikes in barley caused by hormone derivatives. Ann. Agr. Coll. Sweden **14:** 366–372. 1947. BA **22:** 19246.
9. ———— and WIEBE, G. A. Irregular barley, *Hordeum irregulare*, sp. nov. Jour. Wash. Acad. Sci. **35:** 161–164. 1945.
10. ———— and ————. Classification of barley varieties grown in the United States and Canada in 1945. U. S. Dept. Agr., Tech. Bull. 907. 190 pp. 1946.
11. ———— and ————. Taxonomic value of characters in cultivated barley. U. S. Dept. Agr., Tech. Bull. 942. 88 pp. 1948.
12. ———— *et al.* Ash content of barley awns and kernels as influenced by location, season, and variety. Jour. Am. Soc. Agron. **37:** 583–586. 1945.
13. AKERMAN, A. Untersuchungen über die Vererbung gelb und weissgestreifter Blattfarbe beim Hafer. Bot. Not. **1933:** 255–270. 1933.
14. ALEXANDROV, V. G. [The endosperm structure of a grain in Gramineae]. Bot. Zhurn. USSR **24:** 58-92. 1939. [Russian]
15. ————. [History of development and morphology of caryopsis of some grasses of the type of Hordeae]. Sovet. Bot. **1943:** 24–35. 1943. [Russian]
16. ———— and ALEXANDROVA, O. G. On embryosac and antipodes. Jour. Bot. URSS **31**(6): 13–24. 1946. [Russ. with Eng. sum.]
17. ALMEDIA, J. M. DE. [Earliest stages in the development of the barley spike in winter and summer varieties]. Agron. Lusitana **4:** 223–230. 1942. [Port. with Ger. sum.]
18. ANDERSON, J. A. Factors related to the protein content of malting barley. Wallerstein Lab. Comm. **7:** 179–191. 1944.
19. ———— *et al.* Varietal differences in barleys and malts. XII. Summary of correlations between 18 major barley, malt and malting properties. Canad. Jour. Res. C. **19:** 278–291. 1941.
20. ANDERSSON, G. Auslese von winterfesten Transgressionen bei Wintergerste durch Gefrierversuche. Züchter **7:** 254–260. 1935.

[1] Most of the citations have been personally perused and checked by the writer. However, it is inevitable that some errors are present. Where possible, an abstract has been used if the original (or microfilm or photoprint) could not be examined. Abstracts from Plant Breeding Abstracts (PBA), Biological Abstracts (BA), Botanical Abstracts (Bot. A.) and Chemical Abstracts (CA) are cited by volume and abstract number. Those from Experiment Station Record (ESR) are cited by volume and page number. See also Addenda to Bibliography.

21. ————. Vergleichende Untersuchungen der Assimilations-intensität diploider und tetraploider Gerste. Svensk. Bot. Tids. **37**: 175–199. 1943.
22. ANDO, H. [Studies on the genetics of barley]. Jap. Jour. Genet. **1**(2): 1918. [Rep. Jap. Assoc. Breed. Sci.] **2**(2): 1–7. 1918. Bot. A. **1**: 474. [Japanese]
23. ANDRÉS, J. M. Número de cromosomas en las especies del género *Hordeum* espontáneas en los alrededores de Buenos Aires. Univ. Buenos Aires, Rev. Fac. Agron. Vet. **9**: 100–107. 1941.
24. ANONYMOUS. Barley breeding bibliography. Imp. Bur. Plant Genet., Cambridge, Eng. 24 pp. 1930. [Mimeo.]
25. ANTHONY, S. and HARLAN, H. V. Germination of barley pollen. Jour. Agr. Res. **18**: 525–536. 1920.
26. ARARATJAN, A. G. Über die Meiosis zweier Getreidearten. Compt. Rend. (Dok.) Acad. Sci. URSS **28**: 645–648. 1940.
27. ARBER, A. Studies in the Gramineae. VII. On *Hordeum* and *Pariana*, with notes on 'Nepaul Barley'. Ann. Bot. **43**: 507–533. 1929.
28. ————. The Gramineae. 480 pp. 1934.
29. ARNASON, T. J. Chromosome breakage induced by absorbed radioactive phosphorus. Cold Spring Harbor Symp. Quant. Biol. **13**: 1–5. 1948.
30. ———— *et al.* Chromosome breakage in plants induced by radioactive phosphorus, P^{32}. Science **107**: 198–199. 1948.
31. ———— *et al.* Chromosome breakage induced by absorbed radioactive phosphorus, P^{32}. Canad. Jour. Res. C. **26**: 109–114. 1948.
32. ———— *et al.* Inheritance of variegation in barley. Canad. Jour. Res. C. **24**: 145–157. 1946.
33. ———— and WALKER, G. W. R. An irreversible gene-induced plastid mutation. Canad. Jour. Res. C. **27**: 172–178. 1949.
34. ARNY, D. C. Inheritance or resistance to barley stripe. Phytopath. **35**: 781–804. 1945.
35. ————. Inheritance of resistance to a second strain of the barley stripe fungus. Abs. of paper presented at Am. Soc. Agron. Meetings, Cincinnati, Nov. 1947.
36. ————. Inheritance of resistance to spot blotch of barley. Phytopath. **38**: 1. 1948. [Abs.]
37. ATKINS, I. M. and MANGELSDORF, P. C. The isolation of isogenic lines as a means of measuring the effects of awns and other characters in small grains. Jour. Am. Soc. Agron. **34**: 667–668. 1942.
38. AUFHAMMER, G. Untersuchungen an Basalborsten vielzeiliger Wintergersten. Forts. Landw. **3**: 678–681. 1928.
39. ————. Ein Beitrag zur Kenntnis der Basalborste bei *Hordeum polystichum*. Pflanzenbau, Pflanzenschutz, Pflanzenzücht. **8**: 231–237. 1931.
40. ———— und PECH, W. Die Behaarung der Basalblattscheiden bei *Hordeum sativum*. Pflanzenbau, Pflanzenschutz, Pflanzenzücht. **8**: 49–61. 1931. BA **6**: 14169.
41. AUSEMUS, E. R. Breeding for disease resistance in wheat, oats, barley and flax. Bot. Rev. **9**: 207–260. 1943.
42. AUSTENSON, H. M. Linkage relations of the male sterile gene ms_8 in barley. Thesis (MS), Univ. Sask. 41 pp. 1948. [Typed]
43. AVDULOW, N. P. Karyo-systematische Untersuchung der Familie Gramineen. Bull. Appl. Bot., Genet., & Pl. Breed. Supp. 43. 428 pp. 1931. [Russ. with Ger sum.]
44. BAKHTEIEV, F. Ch. Geographical variation of the length of the vegetation period in various barley types. Lenin's All Union Acad. Agr. Sci. All-Union Inst. Pl. Breed. 40 pp. 1935. [Russ. with Eng. sum.]

45. ————. Data on the intravarietal crossing of barley. Bull. Acad. Sci. URSS Ser. Biol. (4) : 471–484. 1945. [Russ. with Eng. sum.]
46. ———— and DAREVSKAYA, E. M. An intergeneric hybrid between barley and *Elymus*. Compt. Rend. (Dok.) Acad. Sci. URSS **47**: 300. 1945.
47. ———— and ————. [A hybrid between barley and *Elymus*.] Trudy Zonal. Inst. Zernovovo Khoziaistva Nechernozemnoi Polosy USSR **13**: 138–139. 1946. [Russian]
48. BARBACKI, S. Studies on barley. I. Some problems of variability and inheritance of morphological characters. Mem. Inst. Nat. Polon. Ec. Rur. Pulawy. **10**: 126–162. 1929. [Polish with Eng. sum.]
49. ————. Studies in barley. II. Variability and inheritance of some physiological characters. The importance of breeding characters. Mem. Inst. Nat. Polon. Ec. Rur. Pulawy. **11**: 579–610. 1930. [Polish with Eng. sum.]
50. ————. Studies on barley. III. Variability and inheritance of nitrogen content of the grain of pure lines and hybrids. Mem. Inst. Nat. Polon. Ec. Rur. Pulawy. **14**: 106–157. 1933. [Polish with Eng. sum.]
51. ————. Further research on the inheritance and variability of nitrogen content in the grain of barley. Rocsn. Nauk Rolnicz. i Lesnych [Polish Agr. & Forest Ann.] **49**: 267–315. 1947. [Polish with Eng. sum.]
52. BAUMAN, A. Barley with orange lemmas. Bull. Appl. Bot. & Pl. Breed. **16**(3) : 181–186. 1926.
53. BEAVEN, E. S. Barley (Fifty years of observation and experiment). 394 pp. 1947.
54. BELK, E. Studies in the anatomy and morphology of the spikelet and flower of the Gramineae. Thesis (PhD) Cornell Univ. 183 pp. 1939. [Typed]
55. BELL, G. D. H. The classification and identification of some two-row varieties of barley cultivated in Great Britain, including a description of the use of grain and vegetative characters for this purpose. Zeits. Zücht. A. Pflanzenzücht. **22**: 81–146. 1937.
56. ————. A study on the date of ear emergence in barley. Jour. Agr. Sci. **29**: 175–228. 1939.
57. ———— and CARSON, G. P. The inheritance of rachilla length in barley. Jour. Agr. Sci. **31**: 246–279. 1941.
58. BENĚS, V. Über die Bastardierungsvorgänge bei einer normalen zweizeiligen Sommergerstenlinie X abnormale verzweigte sechszeilige Gerstenform Mack. Česk. Akad. Zeměd. Věstnik **5**: 209-212. 1929. [Czech with Ger. sum.]
59. BERG, K. H. Autotetraploidie bei *Hordeum bulbosum* L. Züchter **8**: 151–158. 1936.
60. BERG, S. O. Weibulls Pukekern. Weib. Arsb. **21**: 16–22. 1926.
61. BERGAL, P. Contribution à l'étude des lodicules (ou glumellules de l'orge *H. sativum* Jess.) Ann. Épiphyties et Phytogénétique **5**: 555–563. 1939.
62. BEVER, W. M. Reaction of wheat, barley, and rye varieties to stripe rust in the Pacific Northwest. U. S. Dept. Agr., Cir. 501. 14 pp. 1938.
63. BIFFEN, R. H. The inheritance of sterility in the barleys. Jour. Agr. Sci. **1**: 250–257. 1905.
64. ————. Experiments on the hybridisation of barleys. Cambridge Phil. Soc., Proc. **13**: 304–308. 1906.
65. ————. An attempt to find a basis for the improvement of the barley crop. Jour. Brew. Inst. **12**: 344–369. 1906.

66. ————. Modern plant-breeding methods: With special reference to the improvement of wheat and barley. Sci. Prog., London **1**: 702–722. 1907.
67. ————. Studies in the inheritance of disease-resistance. Jour. Agr. Sci. **2**: 109–128. 1907.
68. ————. The hybridisation of barleys. Jour. Agr. Sci. **2**: 183–206. 1907.
69. BITTER, C. R. The effect of high frequency irradiation upon *Hordeum vulgare*. Jour. Col.-Wy. Acad. Sci. **2**(4): 25. 1938. [Abs.]
70. ————. The effect of high frequency irradiation upon barley seeds. Univ. Col. Studies **23**: 209–215. 1936.
71. BLACKMAN, V. H. *et al.* The effect of a direct current of low intensity on the rate of growth of the coleoptile of barley. Proc. Royal Soc., London **95**: 214–228. 1923.
72. BLANCO, R. and HOMEDES, J. Estudio del período meiótico de una raza de *Hordeum hexastichum* L. Bol. Inst. Nac. Inv. Exp. Agron. Forest. **2**: 58–69. 1928.
73. BLARINGHEM, L. Recherches sur les hybrides d'orges. Compt. Rend. Acad. Sci., Paris **146**: 1293–1295. 1908.
74. ————. Sur les hybrides d'orges et la loi de Mendel. Compt. Rend. Acad. Sci., Paris **148**: 854–857. 1909.
75. ————. L'Hérédité in mosaique. Quat. Conf. Int. Génét. 101–151. 1911. [French with Eng. sum.]
76. ————. Études sur les hybrides d'orges (*Hordeum*). I. Valeur génétique des characteres utilisés pour le contrôle de la pureté des semences. Ann. Sci. Agron. VI. **38**: 177–230. 1921.
77. ————. Hérédité des charactères physiologiques chez les hybrides d'orges. Compt. Rend. Acad. Sci., Paris **173**: 1396–1398. 1921.
78. ————. Hérédité des charactères physiologiques chez les hybrides d'orges. (Deuxième génération). Compt. Rend. Acad. Sci., Paris **175**: 230–232. 1922.
79. BLINOVA, N. P. [On the technique of crossing spring barley.] [Breeding and Seed Growing] 2–3: 36–39. 1939. PBA **9**: 1485. [Russian]
80. BOEUF, F. Formes tératologiques chez *Hordeum vulgare*. Compt. Rend. Assoc. Franc. Avanc. Sci. **42**: 301–303. 1914.
81. BOKURA, U. [Report on sclerotial disease of wheat and barley.] [Jour. Plant Protect.] **13**(8): 476–489. 1926. [Japanese]
82. BONNETT, O. T. Tillering in barley as influenced by certain plant characteristics. Thesis (PhD) Univ. Illinois. 1933.
83. ————. The development of the barley spike. Jour. Agr. Res. **51**: 451–457. 1935.
84. ————. Hood and supernumerary spike development in barley. Jour. Agr. Res. **57**: 371–377. 1938.
85. ————. Seed setting and average seed weight as affected by two methods of opening barley flowers for emasculation. Jour. Am. Soc. Agron. **30**: 501–506. 1938.
86. BORODIN, D. N. Yarovization formulas for winter oats and barleys. Am. Jour. Bot. **20**: 677–678. 1933.
87. BORODIN, I. The influence of nitrogenous and mineral nutrition on the time of heading in barley and millet, under conditions of different day-lengths. Bull. Appl. Bot., Genet., & Pl. Breed. **27**(5): 171–195. 1931. [Russ. with Eng. sum.]
88. BORTHWICK, H. A. *et al.* Action spectrum for photoperiodic control of floral initiation of a long-day plant, Wintex barley (*Hordeum vulgare*). Bot. Gaz. **110**: 103–118. 1948.
89. BOSE, R. D. Studies in Indian barleys. I. Classification of types isolated at Pusa. Indian Jour. Agr. Sci. **1**: 58–88. 1931.

90. ————. Studies in Indian barleys. III. Branched ears in barley and their mode of inheritance. Indian Jour. Agr. Sci. **5:** 155–164. 1935.
91. ————, *et al.* Studies in Indian barleys. IV. The inheritance of some anatomical characters responsible for lodging and some ear-head characters in an interspecific cross between two Pusa barleys. Indian Jour. Agr. Sci. **7:** 48–88. 1937.
92. BRADY, J. Some factors influencing lodging in cereals. Jour. Agr. Sci. **24:** 209–232. 1934.
93. BRANDT, K. *et al.* Gramin und zwei Begleiter desselben in Laubblättern von Gerstensorten. Zeits. Physiol. Chem. **235:** 37–42. 1935.
94. BRENCHLEY, W. E. The development of the grain of barley. Ann. Bot. **26:** 903–928. 1912.
95. ————. The phosphate requirement of barley at different periods of growth. Ann. Bot. **43:** 89–110. 1929.
96. BRIGGS, F. N. Inheritance of resistance to mildew, *Erysiphe graminis hordei*, in a cross between Hanna and Atlas barley. Jour. Agr. Res. **51:** 245–250. 1935.
97. ————. The inheritance of resistance to mildew. Amer. Nat. **72:** 34–41. 1938.
98. ————. Linkage relations of factors for resistance to mildew in barley. Genetics **30:** 115–118. 1945.
99. ———— and BARRY, G. L. Inheritance of resistance to mildew, *Erysiphe graminis hordei*, in a cross of Goldfoil and Atlas barleys. Zeits. Zücht. A. Pflanzenzücht. **22:** 75–80. 1937.
100. ———— and STANFORD, E. H. Linkage of factors for resistance to mildew in barley. Jour. Genet. **37:** 107–117. 1938.
101. ———— and ————. Linkage relations of the Goldfoil factor for resistance to mildew in barley. Jour. Agr. Res. **66:** 1–5. 1943.
102. BRINK, R. A. and COOPER, D. C. Embryo viability and development of the seed following interspecific hybridization. Rec. Genet. Soc. Am. **12:** 43–45. 1943. [Abs.]
103. ———— and ————. The antipodals in relation to abnormal endosperm behavior in *Hordeum jubatum* × *Secale cereale* hybrid seeds. Genetics **29:** 391–406. 1944.
104. ———— and ————. The endosperm in seed development. Bot. Rev. **13:** 423–541. 1947.
105. ———— *et al.* A hybrid between *Hordeum jubatum* and *Secale cereale* reared from an artificially cultivated embryo. Jour. Hered. **35:** 67–75. 1944.
106. BROILI, J. Versuche mit Brandinfektion zur Erzielung brandfreier Gerstenstämme. Naturw. Zeits. Forst. Landw. **8:** 335–344. 1910.
107. BROOKINS, W. W. Linkage relationship of the genes differentiating stem rust in barley. Thesis (PhD), Univ. Minn. 46 pp. 1940. [Typed]
108. BROWN, A. J. and WORLEY, F. P. The influence of temperature on the absorption of water by seeds of *Hordeum vulgare* in relation to the temperature coefficient of chemical change. Proc. Royal Soc., London, B. **85:** 546–553. 1912.
109. BROWN, E. *et al.* Dormancy and the effect of storage on oats, barley and sorghum. U. S. Dept. Agr., Tech. Bull. 953. 30 pp. 1948.
110. BROWN, H. T. and MORRIS, G. H. Researches on the germination of some of the Gramineae. Jour. Chem. Soc. **57:** 458–528. 1890.
111. BROWN, R. Studies in germination and seedling growth. I. The water content, gaseous exchange, and dry weight of attached and isolated embryos of barley. Ann. Bot. **7:** 93–113. 1943.
112. BRYANT, A. E. A demonstration of the connection of the protoplasts of the endodermal cells with the casparian strips in the roots of barley. New Phyt. **33:** 231. 1934.

113. ————. Comparison of anatomical and histological differences between roots of barley grown in aerated and in non-aerated culture solution. Plant Physiol. **9:** 389–391. 1934.
114. BUCHINGER, A. Die Zusammenhänge zwischen Saugkraft und Plasmatischer Vererbung. Genetica **12:** 539–561. 1930.
115. BUCKLEY, G. F. H. Inheritance in barley with special reference to the color of caryopsis and lemma. Sci. Agr. **10:** 460–492. 1930.
116. BULAVAS, J. Smooth awned barley. Zĕmes Ūkio Akad. Metraštis **11:** 120–141. 1937. [Lithuanian with Ger. sum.]
117. BURNHAM, C. R. A gene for "long" chromosomes in barley. Genetics **31:** 212–213. 1946. [Abs.]
118. ————. Chromosome translocations in barley.. Agron. Jour. [In press.]
119. BUSSELL, F. P. U. S. Dept. Agr., Yrbk. p. 344. 1936.
120. BUZZATI-TRAVERSO, A. A bibliography of genetic research published in Italy and Germany, 1939–1945. Heredity **1:** 19–51. 1947.
121. CALDECOTT, R. S. and SMITH, L. Resuscitation of heat-inactivated seeds with x-radiation. Jour. Hered. **39:** 195–198. 1948.
122. CAMUS, A. Racheole and pedicel of spikelet in *Hordeum*. Bull. Mus. Hist. Nat. Paris **1928**(1) : 113–114. 1928.
123. CARNE, W. M. and LIMBOURN, E. J. The occurrence of certain natural cross-breeds in oats and barley at the State Experiment Farm, Merredin, Western Australia. Royal Soc. West. Australia, Jour. & Proc. **10:** 69–73. 1924.
124. CHEN, S.-L. *et al.* Studies on colchicine-induced autotetraploid barley. I and II. Cytological and morphological observations. Am. Jour. Bot. **32:** 103–106. 1945.
125. ———— and TANG, P. S. Studies on colchicine-induced autotetraploid barley. III. Physiological studies. Am. Jour. Bot. **32:** 177–179. 1945.
126. ———— and ————. Studies on colchicine-induced autotetraploid barley. IV. Enzyme activities. Am. Jour. Bot. **32:** 180–181. 1945.
127. CHIA, W. L. Inheritance study in barley. Thesis (PhD), Cornell Univ. 122 pp. 1939. [Typed]
128. CHIN, T. C. The cytology and genetics of *Hordeum*. Abs. Diss. Univ. Camb. (1939–40) **1941:** 13–14. 1941. PBA **11:** 269.
129. ————. The cytology of some wild species of *Hordeum*. Ann. Bot. **5:** 535–545. 1941.
130. CHRISTENSEN, J. J. Studies on the parasitism of *Helminthosporium sativum*. Minn. Agr. Exp. Sta., Tech. Bull. 11. 42 pp. 1922.
131. ————. Non-parasitic leaf spots of barley. Phytopath. **24:** 726–742. 1934.
132. ———— *et al.* Susceptibility of barley varieties to Fusarial head blight in Minnesota. Phytopath. **19:** 80. 1929. [Abs.]
133. CHRISTIE, W. v. and GRAN, H. H. Die Einwirkung verschiedener Klimaverhältnisse auf reine Linien von Hafer und Gerste. Hereditas **8:** 207–228. 1927.
134. CHRISTOFF, M. A. Untersuchungen über die Kältefestigkeit der Wintergerste. Zeits. Pflanzenzücht. **23:** 47–90. 1939. PBA **9:** 1487.
135. COLIN, H. La déscendance de l'hybride orge noire et lisse × orge blanche et rugueuse. Bull. Soc. Bot. France **80:** 537–542. 1933.
136. ———— and TROUARD-RIOLLE, Y. Dissociation de l'hybride: Orge noire à barbes lisses × Orge Albert. Compt. Rend. Acad. Sci., Paris **176:** 854–856. 1923.
137. ———— and ————. Le croisement orge noire à barbes lisses × orge blanche à barbes rugueuses (Orge Albert). Compt. Rend. Acad. Sci., Paris **180:** 1129–1131. 1925.

138. COLLINS, E. J. The structure of the integumentary system of the barley grain in its relation to localized water absorption and semi-permeability. Ann. Bot. **32:** 381–414. 1918.
139. COLLINS, J. L. A low temperature type of albinism in barley. Jour. Hered. **18:** 331–334. 1927.
140. COMPTON, R. H. On right- and left-handedness in barley. Camb. Phil. Soc., Proc. **15:** 495–506. 1910.
141. ————. A further contribution to the study of right- and left-handedness. Jour. Genet. **2:** 53–70. 1912.
142. COOPER, D. C. and BRINK, R. A. Collapse of the seed following the mating of *Hordeum ubatum* × *Secale cereale*. Genetics **29:** 370–390. 1944.
143. COTTER, R. U. and LEVINE, M. N. Physiologic specialization in *Puccinia graminis secalis*. Jour. Agr. Res. **45:** 297–315. 1932.
144. COVAS, G. Taxonomic observations on the North American species of *Hordeum*. Madroño **10:** 1–21. 1949.
145. CROCKER, W. Life-span of seeds. Bot. Rev. **4:** 235–274. 1938.
146. DAANE, A. Linkage relations in barley. Minn. Agr. Exp. Sta., Tech. Bull. 78. 30 pp. 1931.
147. D'AMATO, F. and GUSTAFSSON, Å. Studies on the experimental control of the mutation process. Hereditas **34:** 181–192. 1948.
148. DARLINGTON, D. C. and JANAKI AMMAL, E. K. Chromosome atlas of cultivated plants. 397 pp. 1945.
149. DASANANDA, S. Quantitative and qualitative inheritance in barley. Thesis (PhD), Cornell Univ. 134 pp. 1943. [Typed]
150. DAVID, P. A. A study of crosses between Trebi and three smooth-awned varieties of barley. Iowa State Coll., Jour. Sci. **5:** 285–314. 1931.
151. DE FAZI, R. Action of ultra-violet rays on the germination of barley in malting. Atti Accad. Lincei **11:** 1022–1024. 1930.
152. DELUAUNAY, L. N. and DIDUS, V. I. [The efficacy of intravarietal selection in line varieties of self-pollinated crops.] [Breeding and Seed Growing] **13**(7) : 16–24. 1946. PBA **18:** 60.
153. DEMING, G. W. and ROBERTSON, D. W. Dormancy in small-grain seeds. Col. Agr. Exp. Sta., Tech. Bull. 5. 12 pp. 1933.
154. DERMEN, H. Colchicine polyploidy and technique. Bot. Rev. **6:** 599–635. 1940.
155. DERR, H. B. A new awnless barley. Science **32:** 473–474. 1910.
156. DICKSON, J. G. Diseases of field crops. 429 pp. Chap. 3, Barley diseases, pp. 19–64. 1947.
157. DIDUS, V. I. Beiträge zum Studium der spontanen Variabilität "reiner" Linien von *Hordeum* I. Eine neue Varietät zweireihiger Kulturgerste *Hordeum distichum* var. *triaristatum mihi*. Jour. Bot. URSS **21:** 189–195. 1936. [Russ. with Ger. sum.]
158. ————. [Natural mutations in "pure lines" as a source of new varieties of self-fertilized plants.] [Breeding and Seed Growing.] **5:** 30–34. 1938. [Russian]
159. DEITZ, S. M. The varietal response and inheritance of resistance in barley to *Erysiphe graminis hordei* P. F. 4. Iowa State Coll., Jour. Sci. **5:** 25–33. 1930.
160. ———— and MURPHY, H. C. Inheritance or resistance to *Erysiphe graminis hordei*. Phytopath. **20:** 119–120. 1930. [Abs.]
161. DORSEY, E. Chromosome doubling in the cereals. Jour. Hered. **30:** 393–395. 1939.
162. DUCHÁČEK, F. and MĚŠTAN, F. Mälzungsversuche mit gezüchteten Gerstensorten. Ceskoslov. Akad. Zemed. Sbornik A. **3:** 453–496. 1928. [Czech with Ger. sum.]
163. DUGGAR, B. M. (Editor). Biological effects of radiation. 2 vols. 1343 pp. 1936.

164. DUTKIEWICZÓWNA, B. [The inheritance of nitrogen content in pure lines of barley.] Mem. Inst. Nation. Polon. Ec. Rur. Pulawy. **5:** 332–335. 1924. ESR **55:** 633.
165. EATON, F. M. The effect of boron on powdery mildew and spot blotch of barley. Phytopath. **20:** 967–972. 1930.
166. EHRENBERG, L. *et al.* Radiophosphorus, seedling lethality and chromosome disturbances. Hereditas **35:** 469–489. 1949.
167. EIGSTI, O. I. Colchicine bibliography. With supplement by P. Dustin, Jr. Lloydia **10:** 65–114. 1947.
168. EIKELAND, H. J. Natural crossing in oats and barley. Beretn. Statens Forsøk., Forus 1927 and 1928. pp. 34–88. 1929 [Norweg. with Eng. sum.]
169. EKDAHL, I. Comparative studies in the physiology of diploid and tetraploid barley. Ark. Bot. **31A:** 1–45. 1944.
170. EKSTRAND, H. Ein Fall von erblicher Asyndese bei *Hordeum*. Svensk Bot. Tids. **26:** 292–302. 1932.
171. ELIZAROVA, S. S. Inheritance of enzyme characters. Catalase of barley. Bull. Acad. Sci. URSS Ser. Biol. **1937:** 1781–1787. 1937. [Russ. with Eng. sum.]
172. ————. A contribution to the study of the basal seta in barley. Compt. Rend. (Dok.) Acad. Sci. URSS **51:** 635–636. 1946.
173. ELLENHORN, J. Zytologische Studie über die genetisch bedeutsamen Kernstrukturen. Bull. Appl. Bot., Genet. & Pl. Breed. II. **2**(8): 3–13. 1935. [Russ. with Ger. sum.]
174. EMME, H. Beiträge zur Cytologie der Gersten. I. Karyotypen der Gersten. Zeits. Ind. Abs. Ver. **37:** 229–236. 1925.
175. ENGLEDOW, F. L. Inheritance in barley. I. The lateral florets and the rachilla. Jour. Genet. **10:** 93–108. 1920.
176. ————. Inheritance in barley. II. The awn and the lateral floret. Jour. Agr. Sci. **11:** 159–196. 1921.
177. ————. Inheritance in barley. III. The awn and lateral floret (cont'd): fluctuation: a linkage: multiple allelomorphs. Jour. Genet. **14:** 49–87. 1924.
178. ———— and WADHAM, S. M. Investigations on yield in the cereals. I. Jour. Agr. Sci. **13:** 390–439. 1923.
179. ———— and ————. Investigations on yield in the cereals. Jour. Agr. Sci. **14:** 287–345. 1924.
180. ENOMOTO, N. On the physiological difference between the spring and winter types in wheat and barley. Jour. Agr. Exp. Sta. Nishigahara **1:** 107–138. 1929. [Jap. with Eng. sum.]
181. ERDTMAN, G. Pollen morphology of the cereals. With notes on the pollen morphology in *Triticale*. Swensk Bot. Tids. **38:** 73–80. 1944. [Swed. with Eng. sum.]
182. EULER, H. v. Chemische Untersuchungen an Chlorophyllmutanten. Hereditas **13:** 61–79. 1929.
183. ————. [Influence of saponin and digitalis glycosides on seed germination and mitosis. Action of colchicine and X-rays.] Arkiv Kemi, Mineral., Geol. **22A**(14): 1–10. 1946. CA **41:** 1284a.
184. ————. [The enzymic hydrolysis of hydrogen peroxide in plant extracts. Genetic and chemical influence on the enzyme formation.] Arkiv Kemi, Mineral., Geol. **24A**(13): 1–15. 1947. BA **22:** 25389.
185. ————. [Growth ergones and antiergones.] Svensk Kem. Tids. **58:** 180–187. 1946. CA **41:** 3841d.
186. ———— and BERGMAN, B. Chromatophoren-Degeneration in Laubblättern von chlorophylldefekten Gersten-Mutanten. Ber. Deut. Bot. Ges. **51:** 238–290. 1933.
187. ———— *et al.* Konstanz des Chlorophyllgehaltes und Chromatophorendegeneration chlorophyllmutierender Gerstensippen. Hereditas **21:** 119–128. 1936.

188. ———— and BURSTRÖM, D. Messungen über den Arginingehalt in chlorophylldefekten Blättern. Zeits. Physiol. Chem. **215:** 47–50. 1933.
189. ———— *et al.* [Phytohormones.] Svensk Kem. Tids. **46:** 250–256. 1934. CA **29:** 3009[5].
190. ———— *et al.* [Evolution of barley mutants.] Svensk Kem. Tids. **44:** 23–28. 1932. CA **26:** 4838[8].
191. ———— *et al.* Über die Konstanz des Chlorophyllgehaltes in drei Chlorophyllmutanten. Hereditas **18:** 225–244. 1933.
192. ———— *et al.* Entwicklungschemische Studien an Chlorophyllmutanten der Gerste. Zeits. Physiol. Chem. **212:** 53–60. 1932.
193. ———— *et al.* Versuche über den Einfluss von Wuchsstoffen auf Gersten-Mutanten. II. Arkiv Kemi, Mineral., Geol. **11B**(4)**39:** 1–5. 1934.
194. ———— *et al.* Versuche über den Einfluss von Wuchsstoffen auf Gersten-Mutanten. I. Arkiv Kemi, Mineral., Geol. **11B**(4)**38:** 1–6. 1934.
195. ———— *et al.* Experimentelle Chemische Beiträge zur Erblichkeitsforschung. IV. Zeits. Physiol. Chem. **190:** 247–261. 1930.
196. ———— *et al.* Zur chemischen Charakterisierung von erblichen Chlorophylldefekten. Zeits. Ind. Abs. Ver. **59:** 131–152. 1931.
197. ———— *et al.* Katalase und Zuckerbestimmungen in chlorophylldefekten Pflanzen. Zeits. Physiol. Chem. **203:** 165–177. 1931.
198. ———— and HELLSTRÖM, H. Über die Bildung von Xanthophyll, Carotin und Chlorophyll in belichteten und unbelichteten Gerstenkeimlingen. Zeits. Physiol. Chem. **183:** 177–183. 1929.
199. ———— and ————. Spektrometrische Messungen an Alkoholextrakten der Laubblätter von Chlorophyllmutanten der Gerste. Zeits. Physiol. Chem. **208:** 43–49. 1932.
200. EULER, H. v. and HELLSTRÖM, H. Über ein Indolderivat aus zwei Chlorophyllmutierenden Gerstensippen. Zeits. Physiol. Chem. **217:** 23–27. 1933.
201. ———— *et al.* Über den Chlorophyllgehalt der Laubblätter von Gerstenmutanten. Zeits. Physiol. Chem. **218:** 241–248. 1933.
202. ———— *et al.* [Catalase, redoxase and growth factors in barley mutants.] Svensk Kem. Tids. **46:** 66–70. 1934. CA **28:** 5843[6].
203. ———— *et al.* [Enzymic experiments on sarcoma and chlorophyll-deficient barley mutants.] Zeits. Physiol. Chem. **259:** 201–203. 1939. CA **33:** 6362[4].
204. ———— *et al.* [The indole-base found in barley mutants Albina 1 and 2 and its transformation.] Arkiv Kemi, Mineral., Geol. **11B**(36) : 1–6. 1934. CA **28:** 5502[7].
205. ———— *et al.* Zur chemischen Genetik chlorophyllmutierender Gerstensippen. Vergleich zwischen dem Gehalt an Chlorophyll und Gramin in den Sippen Primus I. Primus II, (Gulvit, Xanthalba und Xanthaurea) (Nilsson-Ehle), Westergaards Linie und einer Linie aus Kreuzung von Goldgerste × Chevalier (Hallquist). Zeits. Physiol. Chem. **234:** 151–164. 1935.
206. ———— *et al.* Experimentelle chemische Beiträge zur Erblichkeitsforschung. Zeits. Physiol. Chem. **182:** 205–217. 1929.
207. ———— and MORITZ, O. Chemische Beiträge zur Kenntnis der Chlorophylldefekte. Archiv Kemi, Mineral., Geol. **10A**(11) : 1–15. 1931.
208. ———— *et al.* Zur Bestimmung der Katalase im Pflanzenmaterial. Zeits. Physiol. Chem. **186:** 212–222. 1930.
209. ———— and NILSSON, H. Enzymchemische Vererbungsstudien. I. Arkiv Kemi, Mineral., Geol. **10B**(6) : 1–6. 1929.
210. ———— and ————. [Quantitative enzyme studies on Mendelian factors.] Naturwiss. **17:** 289–290. 1929.

211. ———— and RUNEHJELM, D. Experimentelle chemische Beiträge zur Erblichkeitsforchung. III. Zeits. Physiol. Chem. **185**: 74–80. 1929.
212. ———— and ————. Chemische Beiträge zur Kenntnis der Chlorophylldefekte. Arkiv Kemi, Mineral., Geol. **10A**(10): 1–8. 1930.
213. ———— and SJÖMAN, B. Dipeptid-spaltung in keimenden Chlorophyll-Mutanten der Gerste. Biochem. Zeits. **264**: 237–245. 1933.
214. ———— *et al.* Experimentelle Chemische Beiträge zur Erblichkeitsforschung. II. Zeits. Physiol. Chem. **183**: 113–122. 1929.
215. ———— and WEICHERT, R. Zur Biochemie chlorophylldefekter Gerstenmutanten. I. Messungen an den Mutanten Primus II. (Nilsson-Ehle). Svensk Kemi. Tids. **46**: 301–306. 1934.
216. FALL, C. B. New microphotographs of the more common starches. Chem. Age, New York **31**: 37–39. 1923.
217. FARIS, J. A. Factors influencing infection of *Hordeum sativum* by *Ustilago hordei*. Am. Jour. Bot. **11**: 189–214. 1924.
218. ————. Physiological specialization of *Ustilago hordei*. Phytopath. **14**: 537–557. 1924.
219. FAVORSKY, M. V. New polyploidy-inducing chemicals. Compt. Rend. (Dok.) Acad. Sci. URSS. **25**: 71–74. 1939.
220. FAVRET, E. A. Hallazgo de una nueva raza de *Erysiphe graminis hordei*. Revista Inv. Agr. **1**: 237–240. 1947.
221. ————. On the genetics of resistance to mildew in barley. Phytopath. **39**: 6. 1949. [Abs.]
222. ————. Herencia de la resistencia a *Erysiphe graminis hordei* en cebada II. Estudios con la raza 3 de California. Revista Inv. Agr. **3**: 31–42. 1949.
223. FLORELL, V. H. Effect of date of seeding on yield, lodging, maturity and nitrogen content in cereal varietal experiments. Jour. Am. Soc. Agron. **21**: 725–731. 1929.
224. FORLANI, R. [Cross-fertilization in certain cereals.] Genetica Agraria **1**: 130–146. 1947. PBA **17**: 1606.
225. FRASER, J. G. C. The dominant Mendelian characters in barley breeding. Sci. Agr. **2**: 113–116. 1921.
226. FREISLEBEN, R. Die phylogenetische Bedeutung asiatischer Gersten. Züchter **12**: 257–272. 1940.
227. ————. Untersuchungen an tetraploiden Kulturgersten. Forschungsdienst. **16**: 361–364. 1942.
228. ———— and LEIN, A. Über die Auffindung einer mehltauresistenten Mutante nach Röntgenbestrahlung einer anfälligen reinen Linie von Sommergerste. Naturwiss. **30**: 608. 1942.
229. ———— and ————. Vorarbeiten zur züchterischen Auswertung röntgeninduzierter Mutationen. I. Die in der Behandlungsgeneration (X_1) sichtbare Wirkung der Bestrahlung ruhender Gerstenkörner. Zeits. Pflanzenzücht. **25**: 235–254. 1943.
230. ———— and ————. Vorarbeiten zur züchterischen Auswertung röntgeninduzierter Mutationen. II. Mutationen des Chlorophyllapparates als Testmutationen für die mutationsauslösende Wirkung der Bestrahlung bei Gerste. Zeits. Pflanzenzücht. **25**: 255–283. 1943.
231. ———— and ————. Möglichkeiten und praktische Durchführung der Mutationzüchtung. Kühn-Archiv **60**: 211–225. 1943.
232. ———— and ————. Röntgeninduzierte Mutationen bei Gerste. Züchter **16**: 49–64. 1944.
233. ———— and METZGER, I. Genetische Studien zur Gerstenzüchtung. I. Vererbung und Koppelung der Mehltauresistenz und der Spindelgliedzahl. Zeits. Pflanzenzücht. **24**: 507–522. 1942.

234. FREISTEDT, P. Neue Zielsetzungen in der Gerstenzüchtung. Zeits. Zucht. A. Pflanzenzücht. **20:** 169–209. 1935.
235. FRIESEN, H. A. Awn-barbing in barley. Canad. Jour. Res. C. **24:** 292–297. 1946.
236. FROIER, K. and GUSTAFSSON, A. The influence of x-ray dosage on germination and sprouting ability in barley and wheat. Svensk Bot. Tids. **35:** 43–56. 1941.
237. ———— and ————. The influence of seed size and hull on x-ray susceptibility in cereals. Hereditas **30:** 583–589. 1944.
238. FRUWIRTH, C. Zur Vererbung morphologischer Merkmale bei *Hordeum distichum nutans.* Verhandl. Naturf. Ver. Brünn **49:** 122–129. 1911.
239. FUCHS, W. H. und ZIEGENBEIN, G. Zur Methodik der Züchtung auswuchsfesten Getreides. Züchter **19:** 97–100. 1948.
240. FUNG, F. T. Inheritance study in barley with special reference to the hooded character. Thesis (PhD), Cornell Univ. 72 pp. 1947. [Typed]
241. FYFE, J. L. The action and use of colchicine in the production of polyploid plants. Imp. Bur. Pl. Breed. & Genet. 10 pp. 1939.
242. GAINES, E. F. Inheritance in wheat, barley, and oat hybrids. Wash. Agr. Exp. Sta., Bull. 135. 61 pp. 1917.
243. GAISER, L. O. A list of chromosome numbers in Angiosperms. Genetica **8:** 401–484. 1926.
244. ————. Chromosome numbers in Angiosperms. II. Bibliogr. Genet. **6:** 171–466. 1930.
245. ————. Chromosome numbers in Angiosperms. III. Genetica **12:** 161–260. 1930.
246. ————. Chromosome numbers in Angiosperms. IV. Bibliogr. Genet. **10:** 105–250. 1933.
247. GARBER, R. J. and OLSON, P. J. A study of the relation of some morphological characters to lodging in cereals. Jour. Am. Soc. Agron. **11:** 173–186. 1919.
248. GARDNER, J. L. Studies in tillering. Ecology **23:** 162–174. 1942.
249. GAVAUDAN, P. and GAVAUDAN, N. Action of apiol on karyokinesis and mitosis in certain phanerogams. Compt. Rend. Acad. Sci., Paris **209:** 805–807. 1939.
250. ———— *et al.* Sur l'induction de la polyploidie dans les cellules somatiques de quelques Graminées par action des vapeurs d'acénaphtène. Compt. Rend. Acad. Sci., Paris **207:** 1124–1126. 1938.
251. GELIN, O. E. V. The cytological effect of different seed-treatments in x-rayed barley. Hereditas **27:** 209–219. 1941.
252. GHIMPU, V. La caryologie des plantes cultivées. Bull. Agr. Roumania II. **10:** 149–174. 1929.
253. ————. Contribution à l'étude des satellites du genre *Hordeum.* Compt. Rend. Soc. Biol. **100:** 187–190. 1929.
254. ————. Recherches chromosomiques sur les luzernes, vignes, chênes et orges. XIV Congr. Int. Agr., Bucarest Actes Vol. 4: 557–563. 1929.
255. ————. Orges diploides et tétraploides. Compt. Rend. Acad. Agr., France **15:** 818–821. 1921.
256. ————. Recherches cytologiques sur les genres: *Hordeum, Acacia, Medicago, Vitis,* et *Quercus.* Arch. Anat. Micr. **26:** 135–234. 1930.
257. ————. Satellites des chromosomes dans le règne végétal. Bull. Appl. Hist. Physiol. Path. & Micr. Tech. **7:** 149–155. 1930.
258. ————. Recherches chromosomiques sur les espèces de l'orge. Bull. Min. Agr. Domeniilor 1931. 5/6: 3–28. 1931. PBA **2:** 439. [Roumanian with Fr. sum.]
259. GILL, N. T. The viability of weed seeds at various stages of maturity. Ann. Appl. Biol. **25:** 447–456. 1938.

260. GILLIS, M. C. A genetical study of the fertility of the lateral florets of the barley spike. Jour. Agr. Res. **32:** 367–390. 1926.
261. GIZBERTOWNA, W. The morphology of the coleorhiza of rye, wheat, and barley. [Polish Agr. & For. Ann.] **38:** 49–66. 1937. [Polish with Eng. sum.]
262. GLINYANY, N. P. Inheritance of awns and furcas (hoods) in crosses between *Hordeum vulgare* var. *Nudihaxtoni* × *Hordeum vulgare* var. *Trifurcatum*. Bull. Appl. Bot., Genet. & Pl. Breed. II. **7:** 355–376. 1937. [Russ. with Eng. sum.]
263. GOODSPEED, T. H. and UBER, F. M. Radiation and plant cytogenetics. Bot. Rev. **5:** 1–48. 1939.
264. GORDON, G. S. and RAW, A. R. Wheat-barley matings. Jour. Agr. (Victoria, Australia) **30:** 138–144. 1932.
265. GORDON, M. The development of endosperm in cereals. Proc. Royal Soc. (Victoria, Australia) **34:** 105–116. 1922.
266. GREBENNIKOV, P. E. [The main results of work on plant breeding and genetics of wheat and barley during 1923–1934.] [Proc. Agr. Inst. Krasnodar] **1**(1): 3–58. 1935. [Russian]
267. ————. Materials on the question of the origin of winter barley. [Proc. Agr. Inst. Krasnodar] **1**(1): 65–79. 1935. [Russ. with Eng. sum.]
268. GREGORY, F. G. The effect of climatic conditions on the growth of barley. Ann. Bot. **40:** 1–26. 1926.
269. ———— and BATTEN, L. A critical statistical study of experimental data on the effect of minute electric currents on the growth rate of the coleoptile of barley. Proc. Royal Soc., London, B. **99:** 122–130. 1926.
270. ———— and CROWTHER, F. A physiological study of varietal differences in plants. I. A study of the comparative yields of barley varieties with different manurings. Ann. Bot. **42:** 757–770. 1928.
271. ———— and ————. A physiological study of varietal differences in plants. II. Further evidence for the differential response in yield of barley varieties to manurial deficiencies. Ann. Bot. **45:** 579–592. 1931.
272. ———— and PURVIS, O. N. Abnormal flower development in barley involving sex reversal. Nature **160:** 221–222. 1947.
273. ———— and RICHARDS, F. J. Physiological studies in plant nutrition. I. The effect of manurial deficiency on the respiration and assimilation rate in barley. Ann. Bot. **43:** 119–161. 1929.
274. GREIS, H. Vergleichende physiologische Untersuchungen an diploiden und tetraploiden Gersten. Züchter **12:** 62–73. 1940.
275. GRIFFEE, F. Factor relations in barley species crosses. Anat. Rec. **26:** 384. 1923.
276. ————. Correlated inheritance of botanical characters in barley, and manner of reaction to *Helminthosporium sativum*. Jour. Agr. Res. **30:** 915–935. 1925.
277. ————. Chromosome number in species of *Hordeum*. Univ. Minn., Studies Biol. Sci. **6:** 319–331. 1927.
278. GRUSS, J. Über die Beschaffenheit der durch Schwefelsäure entspelzten Gerste. Wochensch. Brauerei **48:** 342–345. 1931.
279. GUDKOV, A. N. [Determination of colour of barley seeds by chemical method.] [Breeding and Seed Growing] **6:** 32. 1940. [Russian]
280. GUSTAFSSON, A. Über verschiedene Sensibilität und Stabilität der Chromosomen. Bot. Not. **1936:** 488–512. 1936.
281. ————. The different stability of chromosomes and the nature of mitosis. Hereditas **22:** 281–335. 1937.
282. ————. [A genetical proof of differential cell mortality.] Bot. Not. **1937:** 309–310. 1937. [Swedish]

283. ————. Der Tod als ein nuklear Prozess. Hereditas **23:** 1–37. 1937.
284. ————. Studies on the genetic basis of chlorophyll formation and the mechanism of induced mutating. Hereditas **24:** 33–93. 1938.
285. ————. The mutation system of the chlorophyll apparatus. Lunds. Univ. Arsskr. N. F. Avd. **2.36**: 1–40. 1940.
286. ————. Mutation experiments in barley. Hereditas **27:** 225–242. 1941.
287. ————. Preliminary yield experiments with ten induced mutations in barley. Hereditas **27:** 337–359. 1941.
288. ————. [Plant breeding and mutation.] Sverig. Utsädesfören. Tids. **51:** 344–362. 1941. [Swedish]
289. ————. Mutationsforschung und Züchtung. Züchter **14:** 57–64. 1942.
290. ————. The plastid development in various types of chlorophyll mutations. Hereditas **28:** 483–492. 1942.
291. ————. The x-ray resistance of dormant seeds in some agricultural plants. Hereditas **30:** 166–178. 1944.
292. ————. Drastic morphological mutations in barley. Hereditas **32:** 120–122. 1946.
293. ————. The effect of heterozygosity on variability and vigour. Hereditas **32:** 263–286. 1946.
294. ————. [Plant breeding and mutations.] Sverig. Utsädesfören. Tids. **56:** 336–342. 1946. [Swedish]
295. ————. The origin of albina and xantha mutations in barley. Acta Radiol. **27:** 300–307. 1946.
296. ————. The advantageous effect of deleterious mutations. Hereditas **33:** 573–575. 1947.
297. ————. Mutations in agricultural plants. Hereditas **33:** 1–100. 1947.
298. ———— and ÅBERG, E. Two extreme x-ray mutations of morphological interest. Hereditas **26:** 258–261. 1940.
299. ———— and MAC KEY, J. The genetical effects of mustard gas substances and neutrons. Hereditas **34:** 371–386. 1948.
300. ———— and ————. Mutation work at Svalöf. Svalöf 1886–1946: 338–357. 1948.
301. ———— and NYBOM, N. Colchicine, x-rays and the mutation process. Hereditas **25:** 280–284. 1949.
302. HAAN, H. DE. Inheritance of chlorophyll deficiencies. Bibl. Genet. **10:** 357–416. 1933.
303. HAFERKAMP, M. Germination and other tests on superannuated cereal seeds. Assoc. Off. Seed Anal., Proc. **39:** 111–114. 1949.
304. HALLQVIST, C. Gametenelimination bei der Spaltung einer zwerghaften und klorophylldefekten Gerstensippe. Hereditas **4:** 191–205. 1923.
305. ————. Chlorophyllmutanten bei Gerste. Ihre Entstehung und primären Spaltungen. Hereditas **5:** 49–83. 1924.
306. ————. Koppelungen und synthetische Lethalität bei den Chlorophyllfaktoren der Gerste. Hereditas **8:** 229–254. 1927.
307. HANSEN, H. P. Inheritance of resistance to plant diseases caused by fungi, bacteria, and vira. A collective review with a bibliography. Royal Vet., Agr. Coll. (Copenhagen, Denmark) Yrbk. 1934. 74 pp. 1934.
308. HANSON, W. D. and KRAMER, H. H. The genetic analysis of two chromosome interchanges in barley from F_2 data. Genetics **34:** 687–700. 1949.
309. HARA, S. [About albinos in barley.] Jour. Sci. Agr. Soc. Japan **318**: 217–222. 1929. [Japanese]

310. HARLAN, H. V. Some distinctions in our cultivated barleys with reference to their use in plant breeding. U. S. Dept. Agr., Bull. 137. 38 pp. 1914.
311. ————. The identification of varieties of barley. U. S. Dept. Agr., Bull. 622. 32 pp. 1918.
312. ————. Smooth-awned barleys. Jour. Am. Soc. Agron. **12**: 205–208. 1920.
313. ————. Daily development of kernels of Hannchen barley from flowering to maturity at Aberdeen, Idaho. Jour. Agr. Res. **19**: 393–430. 1920.
314. ————. The origin of hooded barley. Jour. Hered. **22**: 265–272. 1931.
315. ————. One man's life with barley. [In press]
316. ———— and ANTHONY, S. Development of barley kernels in normal and clipped spikes and the limitations of awnless and hooded varieties. Jour. Agr. Res. **19**: 431–472. 1920.
317. ———— and HAYES, H. K. Occurrence of the fixed intermediate, *Hordeum intermedium haxtoni*, in crosses between *H. vulgare pallidum* and *H. distichum palmella*. Jour. Agr. Res. **19**: 575–591. 1920.
318. ———— and MARTINI, M. L. Earliness in F_1 barley hybrids. Jour. Hered. **20**: 557–560. 1929.
319. ———— and ————. The lateral flowers of two-rowed barley. Jour. Hered. **26**: 109–113. 1935.
320. ———— and ————. Problems and results in barley breeding. U. S. Dept. Agr., Yrbk. pp. 303–346. 1936.
321. ———— *et al.* The effect of temperature on seed set in barley crosses. Jour. Am. Soc. Agron. **35**: 316–320. 1943.
322. ———— and POPE, M. N. Many-noded dwarf barley. Jour. Hered. **13**: 269–273. 1922.
323. ———— and ————. Germination of barley seeds harvested at different stages of growth. Jour. Hered. **13**: 72–75. 1922.
324. ———— and ————. Some cases of apparent single fertilization in barley. Am. Jour. Bot. **12**: 50–53. 1925.
325. ———— and ————. Development in immature barley kernels removed from the plant. Jour. Agr. Res. **32**: 669–678. 1926.
326. ———— and SHAW, F. W. Barley variety tests at a high altitude ranch near Obsidian, Idaho. Jour. Am. Soc. Agron. **21**: 439–443. 1929.
327. HARRINGTON, J. B. Natural crossing in wheat, oats, and barley at Saskatoon, Saskatchewan. Sci. Agr. **12**: 470–483. 1932.
328. ————. Varietal resistance of small grains to spring frost injury. Jour. Am. Soc. Agron. **28**: 374–388. 1936.
329. ———— and KNOWLES, P. F. Dormancy in wheat and barley varieties in relation to breeding. Sci. Agr. **20**: 355–364. 1940.
330. HARRISON, T. J. Causes of variation in protein content of barley. World's Grain Exhib., Conf. Canada, Proc. **2**: 60–71. 1933.
331. HASEGAWA, N. Chromosome studies on the pollen nuclei of some cereals. Jap. Jour. Genet. **10**: 84–88. 1934.
332. HASSEBRANK, K. Grässerinfektionen mit Getreiderosten. Arb. Biol. Reichsanst. Land. u. Forstwirtsch. **20**: 165–182. 1932. [Cited by Johnston 412.]
333. HAVAS, L. J. A colchicine chronology. Jour. Hered. **31**: 115–117. 1940.
334. HAYDEN, B. and SMITH, L. The relation of atmosphere to biological effects of x-rays. Genetics **34**: 26–43. 1949.
335. HAYES, H. K. Breeding improved varieties of smooth-awned barleys. Jour. Hered. **17**: 370–381. 1926.

336. ————. Breeding disease resistant varieties of small grains in Minnesota. Leopoldina: 250–262. 1928.
337. ————. Inheritance of disease resistance in plants. Am. Nat. **64:** 15–36. 1930.
338. ———— and GARBER, R. J. Breeding crop plants. 2nd ed. 438 pp. pp. 190–197. 1927.
339. ———— and HARLAN, H. V. The inheritance of the length of internode in the rachis of the barley spike. U. S. Dept. Agr., Bull. 869. 26 pp. 1920.
340. ———— and IMMER, F. R. Methods of plant breeding. Inheritance in barley. Chap. 11: 152–164. 432 pp. 1942.
341. ———— and STAKMAN, E. C. Resistance of barley to *Helminthosporium sativum* P. K. B. Phytopath. **11:** 405–411. 1921.
342. ———— *et al.* Reaction of barley varieties to *Helminthosporium sativum*. Minn. Agr. Exp. Sta., Tech. Bull. 21. 47 pp. 1923.
343. ———— and WILCOX, A. N. The physiological value of smooth-awned barleys. Jour. Am. Soc. Agron. **14:** 113–118. 1922.
344. HEGOLD, A. Kreuzungsfragen bei Hafer und Gerste. Pflanzenbau **2:** 173–175. 1925.
345. HEHN, E. R. The inheritance of agronomic characters in barley. Thesis (PhD), Iowa State Coll. 63 pp. 1948. [Typed]
346. ————. The inheritance of agronomic characters in barley. Iowa State Coll. Jour. Sci. **23:** 39–40. 1948. [Abs.]
347. HEIMSCH, C. Development of vascular tissue in barley roots. Am. Jour. Bot. **35:** 794. 1948. [Abs.]
348. HEINISCH, O. Beobachtungen an einer Chlorophyllmutante einer zweizeiligen Sommergerste. Züchter **9:** 163–169. 1937.
349. HEISER, C. B., JR. and WHITAKER, T. W. Chromosome number, polyploidy, and growth habit in California weeds. Am. Jour. Bot. **35:** 179–186. 1948.
350. HEIT, C. E. Report of subcommittee on dormancy in seeds. Assoc. Off. Seed. Anal., Proc. **38:** 25–26. 1948.
351. HEITZ, E. Die Ursache der gesetzmässigen Zahl, Lage, Form und Grösse pflanzlicher Nukleolen. Planta **12:** 775–844. 1931.
352. ————. Die Herkunft der Chromocentren. Dritter Beitrag zur Kenntnis der Beziehung zwischen Kernstruktur und qualitativer Verschiedenheit der Chromosomen in ihrer Längsrichtung. Planta **18:** 571–636. 1932.
353. HERMAN, W. and ESLICK, R. Susceptibility of seedling grasses to damage by grasshoppers. Jour. Am. Soc. Agron. **31:** 333–337. 1939.
354. HESHELE, E. The response of barleys to the parasitic fungus *Helminthosporium teres* Sacc. Bull. Appl. Bot., Genet. & Pl. Breed. **19**(1): 371–384. 1928. [Russ. with Eng. sum.]
355. HEY, A. Beiträge zur Spezialisierung des Gerstenzwergrostes, *Puccinia simplex* Erkiss. et Henn. Arb. Biol. Reich. Land- u. Forstw. **19:** 227–261. 1931.
356. HIGGINS, E. C. Frequency of multiple sprouts in some seeds. Assoc. Off. Seed Anal., Proc. **38:** 68–69. 1948.
357. HIND, H. L. and BISHOP, L. R. Physiological characteristics of different types of barley and their relation to brewing quality. World's Grain Exhib., Conf., Canada, Proc. **2:** 74–83. 1933.
358. HIRAYOSHI, I. Some observations on the blooming of *Triticum* and allied genera in relation to systematics. Jap. Jour. Genet. **17:** 265–294. 1941. [Jap. with Eng. sum.]
359. HOFFMANN, W. Die Vererbung der Winter-sommer-form und der Winterfestigkeit der Gerste. Zeits. Pflanzenzücht. **26:** 56–91. 1944.
360. ———— and KUCKUCK, H. Versuche zur Züchtung spelzenfreier, eiweissreicher und mehltauwiderstandsfähiger Gersten. Zeits. Zücht. A. Pflanzenzücht. **22:** 271–302. 1938.

361. HONECKER, L. Chlorophylldefekte bei Gerste. Zeits. Pflanzenzücht. **10:** 172–173. 1925.
362. ————. Chlorophylldefekte bei Sommergerste. Zeits. Pflanzenzücht. **11:** 204–207. 1926.
363. ————. Beiträge zum Mehltauproblem bei der Gerste mit besonderer Berücksichtigung der züchterischen Seite. Pflanzenbau, Pflanzenschutz, Pflanzenzücht. **8:** 78–84. 1931.
364. ————. Über die Modifizierbarkeit des Befalles und das Auftreten verschiedender physiologischer Formen beim Mehltau der Gerste, *Erysiphe graminis hordei* Marchal. Zeits. Zücht. A. Pflanzenzücht. **19:** 577–602. 1934.
365. ————. Die Bedeutung von Letal- und Defektfaktoren bei der Gerste. Forschungsdienst **3:** 80–92. 1936.
366. ————. Über die physiologische Spezialisierung des Gerstenmehltaues als Grundlage für die Immunitätszüchtung. Züchter **10:** 169–181. 1938.
367. ————. Erbanalytische Untersuchungen über Verhalten der Gerste gegenüber verschiedenen physiologischen Rassen des Mehltaues (*Erysiphe graminis hordei* Marchal). Zeits. Pflanzenzücht. **24:** 429–506. 1942.
368. ————. Resistenzüchtung gegen Mehltau und Rost bei Gerste. Erfahrungen und Ergenbnisse vierzigjähriger Züchtungsarbeit. Zeits. Pflanzenzücht. **25:** 209–234. 1943. PBA **15:** 226.
369. HOR, K. S. A new variety of barley with striking characteristics. Science **55:** 378. 1922.
370. ————. Interrelations of genetic factors in barley. Genetics **9:** 151–180. 1924.
371. HUBBARD, V. C. and HARPER, H. J. Effect of clipping small grains on composition and yield of forage and grain. Agron. Jour. **41:** 85–92. 1949.
372. HUBER, J. A. Vererbungsstudien an Gerstenkreuzungen. Biblioth. Genet. **14:** 119–173. 1929.
373. ————. Vererbungsstudien an Gerstenkreuzungen. II. Zur Genetik der Gerstenähre. Zeits. Zücht. A. Pflanzenzücht. **16:** 394–464. 1931.
374. ————. Über den Wintertypus der Gerste. Zeits. Zücht. A. Pflanzenzücht. **17:** 217–227. 1932.
375. ————. Eine atavistische Variation bei der Gerste. Züchter **4:** 33–35. 1932.
376. HUSKINS, C. L. *et al.* Polyteny and polyploidy in differentiated plant tissues and their possible significance. Genetics **33:** 111. 1948. [Abs.]
377. HUYGE, C. and BONNET, J. Essais de germination de l'orge sous rayons ultra-violets. Bull. Inst. Agron. et Stat. Rech. Gembloux **8:** 33–42. 1939. [Fr. with Dutch, Ger., Eng. sum.]
378. IKENO, S. Étude génétique sur les arêtes d'une race d'orge à six rangs. Bot. Mag., Tokyo **31:** 263–267. 1917.
379. ————. Ein Vererbungsversuch über die Grannen bei Gerste. Jap. Jour. Bot. **2:** 189–207. 1924.
380. ————. Studien über die mutative Entstehung eines "intermedium" Typus bei Gerste. Zeits. Ind. Abs. Ver. **37:** 210–228. 1925.
381. ————. Somatische Aufspaltung bei einer Gerstenkreuzung. Hereditas **9:** 193–198.
382. IMAI, Y. A consideration of variegation. Genetics **13:** 544–546. 1928.
383. ————. Non-viable leek-like mutant seedling of barley. Jap. Jour. Genet. **11:** 282–283. 1935.
384. ————. Variation in the rate of recurring plastid mutations in *Hordeum vulgare* caused by differences in the sowing times. Genetics **20:** 36–41. 1935.

385. ————. Recurrent auto- and exomutation of plastids resulting in tricolored variegation of *Hordeum vulgare*. Genetics **21**: 752–757. 1936.
386. ————. Chlorophyll variegations due to mutable genes and plastids. Zeits. Ind. Abs. Ver. **71**: 61–83. 1936.
387. IMMER, F. R. Relation between yielding ability and homozygosis in barley crosses. Jour. Am. Soc. Agron. **33**: 200–206. 1941.
388. ————. Distribution of yields of single plants of varieties and F_2 crosses of barley. Jour. Am. Soc. Agron. **34**: 844–850. 1942.
389. ———— and CHRISTENSEN, J. J. Studies on susceptibility of varieties and strain of barley to *Fusarium* and *Helminthosporium* kernel blight when tested under muslin tents or in nurseries. Jour. Am. Soc. Agron. **35**: 515–522. 1943.
390. ———— *et al.* Reaction of strains and varieties of barley to many physiologic races of stem rust. Phytopath. **33**: 253–254. 1943.
391. ———— and HENDERSON, M. T. Linkage studies in barley. Genetics **28**: 419–440. 1943.
392. Indiana Experiment Station, Purdue. Report of Director. p. 29. 1927.
393. INOUYE, C. Studies on the development of chromosomes in *Hordeum*. Crop Sci. Soc. Japan, Proc. **5**: 29–39. 1929. [Jap. with Eng. sum.]
394. ————. On the connection between the nucleolus and the spireme in *Hordeum*. Crop Sci. Soc. Japan, Proc. **3**: 117–126. 1931. [Jap. with Eng. sum.]
395. ————. Somatic mitosis in *Hordeum sativum*. Crop Sci. Soc. Japan, Proc. **3**: 319–335. 1931. [Eng. and Jap.]
396. ————. Meiotic mitosis in *Hordeum sativum*. Crop Sci. Soc. Jap. Proc. **4**: 304–314. 1932. [Jap. with Eng. sum.]
397. ————. Meiotic mitosis in *Hordeum sativum*. Miyazaki Coll. Agr. & For., Bull. **5**: 77–96. 1933. [Eng. with Jap. sum.]
398. ISENBECK, K. Untersuchungen über *Helminthosporium gramineum* Rabh. im Rahmen der Immunitätszüchtung. Phytopath. Zeits. **2**: 503–555. 1930.
399. ———— and HOFFMAN, W. Gerste *Hordeum sativum* Jess.—Handbuch der Pflanzenzüchtung. (Editors: Roemer, T. and Rudorf, W. II: 130–224. 1939–40.
400. IVANOV, N. N. and SAROVA, N. L. [A rapid microscopic test of albumen content in barley seeds for breeding purposes.] Doklady Vsesojuz. Akad. Seljskokhoz, Nauk. **12**(21): 26–31. 1938. [Russian]
401. IVANOVA, K. V. A new character in barley, "third outer glume"—Its inheritance and linkage with color of the flowering glumes. Bull. Appl. Bot., Genet. & Pl. Breed. II. **7**: 339–353. 1937.
402. JACKSON, V. G. Anatomical structure of the roots of barley. Ann. Bot. **36**: 21–39. 1922.
403. JAKOVLEV, M. S. On the number of fibrovascular bundles in the coleoptile of barleys and oats. Compt. Rend. (Dok.) Acad. Sci. URSS. **17**: 69–72. 1937.
404. JAKOWSKI, Z. [Contribution to the knowledge of barley—a rare hybrid]. Rocz. Nauk Roi. Lesn. **27**: 289–296. 1932. [Polish with Fr. sum.]
405. JAMES, A. L. The carbohydrate metabolism of germinating barley. New Phyt. **39**: 133–144. 1940.
406. JAMES, W. O. and JAMES, A. L. The respiration of barley germinating in the dark. New Phyt. **39**: 145–176. 1940.
407. JENSEN, N. F. Powdery mildew of barley. Studies of yield losses and the inheritance of disease resistance. Thesis (PhD), Cornell Univ. 112 pp. 1943. [Typed]
408. JOACHIM, G. S. The product method of calculating linkage from F_2 data involving semisterility; and its application to a barley translocation. Genetics **32**: 580–591. 1947.

409. JOHANSEN, D. A. Haploids in *Hordeum vulgare*. Proc. Nat. Acad. Sci. **20:** 98–100. 1934.
410. JOHNSON, I. J. and ÅBERG, E. The inheritance of brittle rachis in barley. Jour. Am. Soc. Agron. **35:** 101–106. 1943.
411. JOHNSON, L. Influence of x-rays on the carbohydrates of sunflowers and barley. Jour. Col.-Wy. Acad. Sci. **2**(2–3) : 35. 1937. [Abs.]
412. JOHNSTON, C. O. Reaction of certain varieties and species of the genus *Hordeum* to leaf rust of wheat, *Puccinia triticina*. Phytopath. **26:** 235–245. 1936.
413. JOHNSTON, W. H. Studies on the dehulling of barley kernels with sulphuric acid and on the inheritance of reaction to covered smut, *Ustilago hordei* (Pers.) K. & S. Infection in crosses between Glabron and Trebi barleys. Canad. Jour. Res. C. **11:** 458–473. 1934.
414. ———— and AAMODT, O. S. The breeding of disease-resistant smooth-awned varieties of barley. Canad. Jour. Res. C. **13:** 315–338. 1935.
415. ———— *et al.* Reaction of barley varieties to spring frost. Sci. Agr. **29:** 60–68. 1949.
416. JONES, M. D. and NEWELL, L. C. Size, variability, and identification of grass pollen. Jour. Am. Soc. Agron. **40:** 136–143. 1948.
417. JUDIN, A. F. [Transmutation of the nature of barley.] [Breeding and Seed Growing] **3:** 28–31. 1938. [Russian]
418. KAGAWA, F. On the phylogeny of some cereals and related plants, as considered from the size and shape of chromosomes. Jap. Jour. Bot. **4:** 363–383. 1929.
419. KAISER, K. W. Beiträge zur Anatomie der Blattorgane des Hafers und der Gerste in ihrer Beziehung zur Pflanzenzüchtung. Landw. Jahrb. **61:** 45–80. 1925.
420. KAJANUS, B. and BERG, S. O. Kreuzungsstudien an Gerste. Hereditas **5:** 287–296. 1924.
421. KALT, B. Ein Beitrag zur Kenntnis chlorophylloser Getreidepflanzen. Zeits. Pflanzenzücht. **4:** 143–150. 1916.
422. KAMENSKII, K. V. and OREKHOVA, T. A. Stimulation of maturing seeds to germination by ultra-violet irradiation. Bull. Appl. Bot., Genet. & Pl. Breed. IV. **2:** 67–72. 1937. [Russ. with Eng. sum.]
423. KARPECHENKO, G. D. Tetraploid barleys obtained by high temperature treatment. Biol. Zhurnal **7:** 287–294. 1938. [Russ. with Eng. sum.]
424. ————. New tetraploid barleys—the hulled and the naked. Compt. Rend. (Dok.) Acad. Sci. URSS **21:** 59–62. 1938.
425. ————. Tetraploid six-rowed barleys obtained by colchicine treatment. Compt. Rend. (Dok.) Acad. Sci. URSS **27:** 47–50. 1940.
426. ————. On the transverse division of chromosomes, as a result of colchicine treatment. Compt. Rend. (Dok.) Acad. Sci. URSS **29:** 404–406. 1940.
427. ———— and IVANOVA, K. V. Linkage of genes I and G in barley. Bull. Lab. Genet. Leningrad **9:** 97–108. 1932. [Russ. with Eng. sum.]
428. KASIWADA, S. [On the glutinous and starchy barley and its inheritance.] Crop. Sci. Soc. Japan, Proc. **2:** 193–194. 1930.
429. KAVINA, K. Über den Ursprung unserer Getreidearten. Czech. Acade. Agr., Bull. **2:** 204–206. 1926. [Czech and German]
430. KATTERMAN, G. Sterilitätsstudien bei *Hordeum distichum*. Zeits. Ind. Abs. Ver. **77:** 63–103. 1939.
431. KELLER, W. Seed production on grass culms detached prior to pollination. Jour. Am. Soc. Agron. **35:** 617–624. 1943.
432. KENT, N. F. and BRINK, R. A. Embryonic growth in vitro of immature *Hordeum* embryos. Am. Jour. Bot. **34:** 600–601. 1947. [Abs.]

433. ———— and ————. Growth in vitro of immature *Hordeum* embryos. Science **106:** 547–548. 1947.
434. KEZER, A. and BOYACK, B. Mendelian inheritance in wheat and barley crosses. Col. Agr. Exp. Sta., Bull. 249. 139 pp. 1918.
435. KHODKOV, L. E. [The appearance of "winter" and "semi-winter" plants in a progeny resulting from crossing spring grains.] Yarovizatsia **1:** 47–49. 1941. [Russian]
436. KIESSLING, L. Über eine Mutation in einer reiner Linie von *Hordeum distichum* L. Zeits. Ind. Abs. Ver. **8:** 48–78. 1912.
437. ————. Untersuchungen über die Vererbung von Stickstoffgehalt und Korngrösse der zweizeiligen nickenden Gerste. Zeits. Pflanzenzücht. **3:** 81–147. 1915.
438. ————. Über die spezifische Empfindlichkeit der Gerste gegenüber der Streifenkrankheit. Zeits. Pflanzenzücht. **5:** 31–41. 1917.
439. ————. Über eine Mutation in einer reinen Linie von *Hordeum distichum* L. II. Mitteilung: Bastardierungsversuche. Zeits. Ind. Abs. Ver. **19:** 145–159. 1918.
440. ————. Einige besondere Fälle von Chlorophylldefekten Gersten. Zeits. Ind. Abs. Ver. **19:** 160–176. 1918.
441. KIHARA, H. Cytologische und genetische Studien bei wichtigen Getreidearten mit besonderer Rücksicht auf das Verhalten der Chromosomen und die Sterilität in den Bastarden. Mem. Coll. Sci. Kyoto Imp. Univ. B. (1): 1–200. 1924.
442. ———— *et al.* A list of chromosome-numbers of plants cultivated in Japan. Studies of Chrom. Numb. of Plants, Tokyo. 193–330. 1931.
443. KOKKONEN, P. Untersuchungen über die Wurzeln der Getreidepflanzen. I. Die Wurzelformen, ihr Bau, ihre Aufgabe und Lage im Wurzelsystem. Acta Forest Fennice **37:** 1–144. 1931.
444. KONDO, M. and KASAHARA, Y. [Variety-distinction of wheat and barley by means of phenol coloration.] Crop. Sci. Soc. Japan, Proc. **11:** 230–252. 1939. [Japanese]
445. ———— and TAKAHASHI, R. Feststellung der Sortenechtheit des Saatgutes des Weizens durch Phenolfärbung. Ber. Ohara Inst. Landw. Fors. **8:** 211–221. 1938.
446. ———— *et al.* Untersuchung und Bewertung von Gersten, Weizen, Sojabohnen und Rapssamen. Ber. Ohara Inst. Landw. Fors. **7:** 335–358. 1936.
447. KOPECKY, O. Usage de la micrometrie pour l'analyse des grains d'orge. Vestnik Cesk. Akad. Zemed. **1:** 326–330. 1925. [Czech with French sum.]
448. ————. [Micrometric analysis of barley grain in the spike.] Vestnik Cesk. Akad. Zemed. **2:** 1128–1129. 1926. [Czech]
449. ————. Micrometrische Untersuchungen der Gerstenkörner in der Ähre. Sbornik Cesk. Akad. Zemed. **2:** 653–672. 1927. [Czech with Ger. sum.]
450. KORABLIN, I. I. [New varieties of barley bred at Omsk.] [Breeding and Seed Growing] **11:** 57–59. 1937. PBA **8:** 1542. [Russian]
451. KOSTOFF, D. and STERIKOFF, G. Spring, changeable and winter types of barley from South Thrace, Macedonia and adherent regions. Ann. Univ. Sofia Fac. Agron. **26:** 661–664. 1948. [Russ. with Eng. sum.]
452. KOZLOV, V. P. [On the question of the influence of geographical factors on the hulledness of barleys.] Bull. Appl. Bot., Genet. & Pl. Breed. **17**(2): 169–181. 1927. [Russ. with Eng. sum.]
453. KRAJEVOJ, S. J. On natural selection in populations. Compt. Rend. (Dok.) Acad. Sci. URSS **24:** 716–719. 1939.
454. ————. Experimental production of awned varieties of barley from awnless varieties. Compt. Rend. (Dok.) Acad. Sci. URSS **29:** 419–421. 1940. PBA **11:** 714.

455. ————. [Viable plants from hybridization of defective mutants of barley.] [Hybridization News] **2:** 103–105. 1941. [Russian]
456. ————. Chimeras in barley. Compt. Rend. (Dok.) Acad. Sci. URSS **30:** 488–450. 1941. PBA **12:** 462.
457. ————. Selective fertilization in barley. Compt. Rend. (Dok.) Acad. Sci. URSS. **36:** 105–107. 1942.
458. KRAUS, C. Untersuchungen über die Vererbungsverhältnisse bei Nachkommenschaften reiner Linien. Landw. Zeit. **66:** 457–487. 1917.
459. KRAUSS, L. Entwicklungsgeschichte der Früchte von *Hordeum, Triticum, Bromus* und *Poa* mit besonderer Berücksichtigung ihrer Samenschalen. Jahrb. Wiss. Bot. **77:** 733–808. 1933.
460. ————. [Pericarp and testa of barley and wheat.] Wochens. Brauerei **50:** 209–212. 1933. CA **28:** 2460[2].
461. KUCKUCK, H. Zenienbildung bei Gerste. Züchter **1:** 14–16. 1929.
462. ————. Die Genetik der Gerste. Züchter **2:** 50–60. 1930.
463. ————. Die Entstehung von Wintertypen nach Kreuzung von Sommertypen bei Gerste. Zeits. Ind. Abs. Ver. **53:** 1–25. 1930.
464. ————. Versuch einer vorläufigen Chromosomentopographie bei Gerste. Züchter **2:** 68–72. 1930.
465. ————. The origin of winter barleys from the crossing of summer barleys and their practical and phylogentic importance. World's Grain Exhib. Conf. Canda, Proc. **2:** 83–84. 1933.
466. ————. Über die Entstehung von Wintergersten aus Kreuzung von Sommergersten und über die Beziehungen der Winterfestigkeit zum Winter-Sommertyp. Zeits. Zücht. A. Pflanzenzücht **18:** 259–290. 1933.
467. ————. Züchterische und genetische Versuche mit Gerste. Naturwiss. **22:** 276–278. 1934.
468. ————. Artkreuzungen bei Gerste. Züchter **6:** 270–273. 1934.
469. ————. Züchterische Versuche mit Wintergerste. Zeits. Zücht. A. Pflanzenzücht **21:** 271–276. 1937. PBA **7:** 1257.
470. KUMP, M. [Inheritance of stalk length in barley—*Hordeum sativum* Jess.] Rev. Sci. Agr. (Zagreb) **10**(11): 1–13. 1948. [Yugoslav with Eng. sum.]
471. LACZYNSKA, T. The action of colchicine and different temperatures on roots of *Allium cepa* and *Hordeum vulgare*. Lublin Univ. Marie Curie-Sklodowska, Annales C. **2:** 167–180. 1947. [Polish with Eng. sum.]
472. LARIONOV, D. Zur Frage über den phylogenetischen Zusammenhang zwischen zweizeiliger und vielzeiliger Gerste (*Hordeum sat. distichum* L., and *H. v. polystichum* Doll.) Ang. Bot. **11:** 274–285. 1929.
473. LARSON, A. H. *et al.* Length of the dormant period in cereal seeds. Jour. Agr. Res. **52:** 811–836. 1936.
474. LA RUE, C. D. Regeneration in monocotyledonous seedlings. Am. Jour. Bot. **22:** 486–492. 1935.
475. LAUMONT, P. and ERROUX, J. Observations teratologiques sur l'orge. Bull. Soc. Hist. Nat. Afr. Nord. **26:** 263–268. 1935. PBA **7:** 660.
476. LEA, D. E. Actions of radiations on living cells. 402 pp. 1947.
477. LEASURE, J. K. *et al.* The correlation of certain characters with yield in barley strains. Jour. Am. Soc. Agron. **40:** 370–373. 1948.
478. LEIN, A. Natürliche Standorte von diploidem und tetraploidem *Hordeum bulbosum* L. Züchter. **19:** 6–9. 1948.
479. LEITH, B. D. U. S. Dept. Agr., Yrbk. p. 344. 1936.
480. LEJEUNE, A. J. Correlated inheritance of stem rust reaction, nitrogen content of grain and kernel weight in a barley cross. Sci. Agr. **26:** 198–211. 1946.
481. ————. A note on the reaction of certain barley varieties to race 15B of stem rust (*Puccinia graminis tritici* Erikss. and Henn.). Sci. Agr. **27:** 183–185. 1947.

482. LEONARD, W. H. Inheritance of reduced lateral spikelet appendages in the Nudihaxtoni variety of barley. Jour. Am. Soc. Agron. **34:** 211–221. 1942.
483. ————. Inheritance of fertility in the lateral spikelets of barley. Genetics **27:** 299–316. 1942.
484. LEOPOLD, A. C. The control of tillering in grasses by auxin. Am. Jour. Bot. **36:** 437–440. 1949.
485. ———— and THIMANN, K. V. The effect of auxin on flower initiation. Am. Jour. Bot. **36:** 342–347. 1949.
486. LERNER, J. K. and HOLZNER, G. Beiträge zur Kenntis der Gerste. 106 pp. 1888.
487. LEVAN, A. The pigment content of polyploid plants. Hereditas **29:** 255–268. 1943.
488. ————. The thresholds of colchicine action in barley, rye, diploid oat, and in their artificial tetraploids. Hereditas **32:** 294–295. 1946.
489. LEWICKI, S. Pigments in barley and oats. Pam. Panst. Inst. Nauk Gosp. Wiejsk, Pulawach **10:** 342–362. 1929. [Polish with Eng. sum.]
490. LEWIS, R. M. Awned hoods in barley. Sci. Agr. **14:** 48–49. 1933.
491. LEWITSKY, G. A. The morphology of the chromosomes. Bull. Appl. Bot., Genet. & Pl. Breed. **27**(1): 19–174. 1931. [Russ. with Eng. sum.]
492. LI, T. S. Genetical studies of winter versus spring habits of barley plants from the viewpoint of breeding method. Mem. 25 Ann. Suigen Coll. Agr. & Forest (Korea) 392–414. 1932. [Eng. sum. provided by K. Yamashita]
493. LIEBSCHER, G. Die Erscheinungen der Vererbung bei einem Kreuzungsprodukt zweier Varietäten von *Hordeum sativum*. Jenaische Zeits. Naturwiss. **23:** 215–232. 1889. Abs. in Botan. Centr. **40:** 232–234. 1889.
494. LITARDIÈRE, R. DE. Observations sur *l'Hordeum Pavisi* Préaub.; des caractères cytologiques. Bull. Soc. Bot. France **73:** 218–224. 1926.
495. LIVINGSTON, J. E. The inheritance of resistance to *Ustilago nuda*. Phytopath. **32:** 451–466. 1942.
496. LOFGREN, N. Tryptophan und Chlorophyll in Keimblättern mutierender Gerstesorten. Zeits. Physiol. Chem. **241:** 142–147. 1937. PBA **9:** 1483.
497. LORENZ, E. Zweijährige variationsstatistische Untersuchungen an reinen Linien von Sommergerste. Wiss. Arch. Landw. Abt. A. Pflanzenbau **1:** 399–433. 1929.
498. LUNDEN, A. P. Inheritance studies in barley. Meld. Norges Landbr. **11:** 143–168. 1931. [Norwegian with Eng. sum.]
499. LUTKOV, A. N. Artificial induction of a liguleless form of barley by means of x-rays. Bull. Appl. Bot., Genet. & Pl. Breed. II. **7:** 197–202. 1937. [Russ with Eng. sum.]
500. ————. Production of a winter form of *Hordeum* by x-ray treatment. Bull. Appl. Bot., Genet. & Pl. Breed. II. **7:** 203–208. 1937.
501. ————. Chlorophyll mutations and other types of hereditary variations in *Hordeum* induced by x-rays. Bull. Appl. Bot., Genet. & Pl. Breed. II. **7:** 209–225. 1937. [Russ. with Eng. sum.]
502. MACKIE, J. R. Localization of resistance to powdery mildew in the barley plant. Phytopath. **18:** 901–910. 1928.
503. MACKIE, W. W. Inheritance of resistance to *Helminthosporium californium* in a cross between Chevalier barley, a resistant variety, and Abyssinian, a susceptible variety. Phytopath. **16:** 764. 1926. [Abs.]
504. ————. Inheritance of resistance to rusty blotch in barley. Jour. Agr. Res. **36:** 965–975. 1928.
505. ————. Inheritance of resistance to barley scald. Phytopath. **19:** 1141. 1929. [Abs.]

506. MACKINNEY, G. Development of the chlorophyll and carotinoid pigments in barley seedlings. Plant Physiol. **10:** 365–373. 1935.
507. MAINE, E. B. Host specialization of barley leaf rust, *Puccinia anomala*. Phytopath. **20:** 873–882. 1930.
508. ————. Host specialization in the leaf rust of grasses, *Puccinia rubigo-vera*. Mich. Acad. Sci., Arts, Letters, Papers **17:** 289–394. 1932.
509. ———— and DIETZ, S. M. Physiologic forms of barley mildew, *Erysiphe graminis hordei* Marchal. Phytopath. **20:** 229–239. 1930.
510. ———— and MARTINI, M. L. Susceptibility of barley to leaf rust (*Puccinia anomala*) and to powdery mildew (*Erysiphe graminis hordei*). U. S. Dept. Agr., Tech. Bull. 295. 33 pp. 1932.
511. MALL, W. Die Ergebnisse verschiedener Getreidebastardierungen. Deut. Landw. Presse **39:** 376–377. 1912.
512. MALLOCH, W. S. An F_1 species cross between *Hordeum vulgare* and *Hordeum muranium*. Am. Nat. **55:** 281–286. 1921.
513. MANN, A. and HARLAN, H. V. Morphology of the barley grain with reference to its enzyme secreting areas. U. S. Dept. Agr., Bull. 183. 32 pp. 1915.
514. MARTINI, M. L. and HARLAN, H. V. Barley freaks. Jour. Hered. **33:** 339–343. 1942.
515. ———— *et al.* Some growth curves of barley kernels. Plant Physiol. **5:** 263–272. 1930.
516. MASSENBACH, H. F. v. Unterlagen für die Züchtung eiweissreicher Gersten. Zeits. Zücht. A. Pflanzenzücht. **21:** 423–450. 1937. PBA **8:** 503.
517. MATHER, K. Biometrical genetics. 158 pp. 1949.
518. MATSUURA, H. A biographical monograph on plant genetics (Genic Analysis), 1900–1929. *Hordeum*, pp. 135–162. Ed. 2. 787 pp. Sapporo 1933.
519. MAUDE, P. F. The Merton catalogue. A list of the chromosome numerals of species of British flowering plants. New Phyt. **38:** 1–31. 1939.
520. MCCALL, M. A. Developmental anatomy and homologies in wheat. Jour. Agr. Res. **48:** 283–321. 1934.
521. MCGREGOR, W. G. Inheritance studies in barley. Thesis (MS), Univ. Minn. 39 pp. 1929. [Typed]
522. MCLENNAN, H. A. Cytogenetic studies of a strain of barley with long chromosomes. Thesis (MS), Univ. Minn. 37 pp. 1947. [Typed]
523. MEAD, H. W. Host-parasite relationships in a seed-borne disease of barley caused by *Helminthosporium sativum* Pammel, King, and Bakke. Canad. Jour. Res. C. **20:** 501–523. 1942.
524. MELNIKOV, A. N. [On the husked cultivated barley.] Bull. Appl. Bot., Genet. & Pl. Breed. A. **14:** 101–106. 1935. [Russian]
525. MENABDE, V. L. Barleys of Georgia (Botanic-taxonomical outline). Trav. Inst. Bot. Tbilissi **6:** 181–246. 1938. [Russ. with Eng. sum.]
526. MEREDITH, W. O. S. and SALLANS, H. R. Varietal differences in barley and malts. XIII. Wort attenuation, viscosity, and turbidity, and their interrelations. Canad. Jour. Res. C. **21:** 351–362. 1943.
527. ———— *et al.* Prediction of malt diastatic power of hybrid barleys. Sci. Agr. **22:** 761–771. 1942.
528. MERRY, J. Studies on the embryo of *Hordeum sativum*. I. The development of the embryo. Bull. Torrey Bot. Club **68:** 585–598. 1941.
529. MEZZADROLI, G. and VARETON, E. The action of short waves, 2–3 m., on amylases. Atti. Accad. Lincei **12:** 594–598. 1930. CA **25:** 4561.
530. MICHE, F. [A curious distribution with 3 maxima. Its genetical significance.] Arch. Klaus-Stift. Vererb-Forsch. **22:** 351–356. 1947. PBA **18:** 1587.

531. MICHELS, C. A. A study of the appearance of awn characters in a cross between Meloy and Faust barley. Am. Nat. **70:** 13–18. 1936.
532. MIDDLETON, G. K. and CHAPMAN, W. H. An association of smooth-awnedness and spring growth habit in barley strains. Jour. Am. Soc. Agron. **33:** 361–366. 1941.
533. ———— and MCMILLEN, R. W. Winter survival of rough- and smooth-awned barleys. Jour. Am. Soc. Agron. **36:** 626–627. 1944.
534. MIÈGE, E. De quelques caractères secondaires pouvant servir à la distinction des sortes dans les orges cultivées. Compt. Rend. Assoc. Franc. Avanc. Sci. (1924) **48:** 1015–1020. 1925.
535. ————. Apparition brusque d'une orge à barbes lisses. Compt. Rend. Acad. Sci., Paris **184:** 762–763. 1927.
536. ————. Note sur une varieté speciale d'orge Marocaine. l'orge du prophète *Hordeum tetrastichum* var. *macroglumis* var. nov. Bull. Soc. Sci. Nat. Maroc. **8:** 144–148. 1928.
537. ————. Réapparition par hybridation spontanée d'une espèce *d'Hordeum* (*H. intermedium* KCK.). Compt. Rend. Acad. Sci., Paris **197:** 185–187. 1933.
538. ————. Modification variétale chez une orge distique. Bull. Soc. Bot. France **77:** 42–44. 1930.
539. ————. L'influence du milieu sur la stabilité des espèces élémentaires *d'Hordeum*. Ann. Sci. Nat. Bot. X **18:** 105–109. 1936.
540. ———— and GRILLOT, G. Les ramifications de l'inflorescence dans le genre *Hordeum*. Compt. Rend. Assoc. Franc. Avanc. Sci. **58:** 153–155. 1934.
541. MILLARD, W. A. and BURGESS, R. Blindness in barley. Univ. Leeds & Yorkshire Coun. Agr. Ed. (Pamphlet) 151. 19 pp. 1927. ESR **57:** 526.
542. MILTHORPE, J., and ROBERTSON, R. N. Studies in the metabolism of plant cells. Australian Jour. Exp. Biol. & Med. Sci. **26:** 189–197. 1948.
543. MIYAKE, K. and IMAI, Y. Genetic studies in barley. Bot. Mag., Tokyo **36:** 25–38. 1922. [Jap., Eng. trans. obtained from F. N. Briggs]
544. MIYAZAWA, B. Über die mosaikartige Spaltung eines Gerstenbastards. Bot. Mag., Tokyo **30:** 359–369. 1916.
545. ————. Dwarf forms in barley. Jour. Genet. **11:** 205–208. 1921.
546. ————. On the inheritance of length and breadth of leaves in the barley. Bull. Miyazaki Coll. Agr. & For. **1:** 1–14. 1929. [Jap. with Eng. sum.]
547. ————. Inheritance of leaf color in barley. Jap. Jour. Genet. **1:** 9–12. 1921. [Japanese]
548. MOLZ, E. Anormale Gerstenähren. Deut. Landw. Presse **40:** 406. 1913.
549. MOSTOVOJ, K. I. Barbs on the awns of the barley as a distinction of varieties. Vestnik Ceskoslov. Akad. Zemed. **5:** 16–22. 1929. [Czech with Ger. and Eng. sum.]
550. ————. A contribution towards the knowledge of the development of the hood of the hooded barley. Vestnik Ceskoslov. Akad. Zemed. **5:** 22–30. 1929. [Czech with Ger. and Eng. sum.]
551. MUNN, M. T. Germinating freshly harvested winter barley and wheat. Assoc. Off. Seed Anal., Proc. **36:** 151–152. 1946.
552. MÜNTZING, A. The evolutionary significance of autopolyploidy. Hereditas **21:** 263–378. 1936.
553. ————. Note on the heteroploid twin plants from eleven genera. Hereditas **24:** 487–491. 1938.
554. ————. Chromosomenaberrationem bei Pflanzen und ihre genetische Wirkung. Zeits. Ind. Abs. Ver. **76:** 323–350. 1939.
555. ————. Differential response to X-ray treatment of diploid and tetraploid barley. Acta Univ. Lund **11**(6) : 1–10. 1941.

556. ————. Experimental alterations of chromosome number and their importance for plant breeding. Kungl. Lantbruskask. Tids. **81:** 97–114. 1942. [Swedish with Eng. sum.]
557. ————. Frequency of induced chlorophyll mutations in diploid and tetraploid barley. Hereditas **28:** 217–221. 1942.
558. ————. [Some results of experiments with ryewheat and tetraploid barley.] Nord. Jordbrugsforsk. (5/6): 250–262. 1943. [Swedish]
559. ————. Experiences from work with induced polyploidy in cereals. Svalöf 1886–1946, pp. 324–337. 1948.
560. ———— and RUNQUIST, E. Note on some colchicine-induced polyploids. Hereditas **25:** 491–495. 1939.
561. ———— *et al.* Tetraploid barley produced by heat treatment. Hereditas **22:** 401–406. 1937.
562. MURTY, G. S. Segregation and correlated inheritance of rust resistance and epidermal characters in a barley cross. Indian Jour. Genet. & Pl. Breed. **2:** 73–75. 1942.
563. MYERS, W. M. Cytology and genetics of forage grasses. Bot. Rev. **13:** 319–421. 1947.
564. MYLER, J. L. Awn inheritance in barley. Jour. Agr. Res. **65:** 405–412. 1942.
565. ———— and STANFORD, E. H. Color inheritance in barley. Jour. Soc. Agron. **34:** 427–436. 1942.
566. NABELEK, F. Wildwachsende Stammformen unserer Gerste aus dem Orient. Wissensch. Arch. Landw. A. Pflanzenbau **1:** 804–807. 1929.
567. NAGASIMA, H. On the developmental change of quantities of chlorophyll and carotinoid in the leaves of rice-plant, barley, and wheat. Jap. Jour. Bot. **9:** 277–296. 1938.
568. NAHMMACHER, J. Beitrag zur Immunitätszüchtung der Gerste gegen *Ustilago nuda forma* spec. *Hordei.* Phytopath. Zeits. **4:** 597–630. 1932.
569. NAKAO, M. Cytological studies on the nuclear division of the pollen mother-cells of some cereals and their hybrids. Tohoku Imp. Univ., Jour. Coll. Agr. Sapporo **4:** 173–190. 1911.
570. NAKAO, S. [A new system of classification of barley according to dynamic system (preliminary).] Jap. Jour. Genet. **23:** 37–38. 1948. [Abs.] [Japanese]
571. NEATBY, K. W. Inheritance of quantitative and other characters in a barley cross. Sci. Agr. **7:** 77–84. 1926.
572. ————. An analysis of the inheritances of quantitative characters and linkage in barley. Sci. Agr. **9:** 701–718. 1929.
573. NEBEL, B. R. and RUTTLE, M. L. Chromosome structure. Genetics **22:** 202. 1937. [Abs.]
574. NELSON, W. L. The yielding ability of bulked F_2 barley crosses and parents in comparative yield trials. Thesis (MS), S. D. State Coll. 30 pp. 1948. [Typed]
575. NEVSKI, S. A. *Hordeae* Benth. Flora U.S.S.R. **2:** 590–728; *Hordeum* L., pp. 722–728. 1934. [Russ., Eng. trans. of sect. on *Hordeum* provided by G. L. Stebbins, Jr.]
576. NEWTON, M. and BROWN, A. M. Studies on the nature of disease resistance in cereals. I. The reactions to rust of mature and immature tissues. Canad. Jour. Res. C. **11:** 564–581. 1934.
577. NEWTON, M. and CHERWICK, W. J. *Erysiphe graminis* in Canada. Canad. Jour. Res. C. **25:** 73–93. 1947.
578. ———— *et al.* The effect of leaf rust of barley on the yield and quality of barley varieties. Canad. Jour. Res. C. **23:** 212–218. 1945.
579. NILOVA, V. P. The action of Roentgen rays on ferments in barley seeds and sprouts. Bull. Appl. Bot., Genet. & Pl. Breed. III. **14:** 109–115. 1936. [Russ. with Eng. sum.]

580. NILSSON-EHLE, H. Einige Beobachtungen über erbliche Variationen der Chlorophylleigenschaft bei den Getreidearten. Zeits. Ind. Abs. Ver. **9**: 289–300. 1913.
581. ————. Über Resistenz gegen *Heterodera Schachti* bei gewissen Gerstensorten, Ihre Vererbungsweise und Bedeutung für die Praxis. Hereditas **1**: 1–34. 1920.
582. ————. Über freie Kombination und Koppelung verschiedener Chlorophyllerbeinheiten bei Gerste. Hereditas **3**: 191–199. 1922.
583. ————. Polymere Röntgenmutationen bei *Hordeum*. Nova Acta Leopoldina, Neue Folge. **6**: 569–570. 1939.
584. ————. The future possibilities of Swedish barley breeding. Svalöf 1886–1946, pp. 113–126. 1948.
585. ————. Chemisch-Experimentelle Beiträge zur Kenntnis einiger Chlorophyllmutanten der Gerste. Arkiv Kemi, Mineral., Geol. **10A**(12): 1–34. 1931.
586. NOGUCHI, Y. Studien über die Entwicklung der Infloreszen und der Blüten bei Getreidepflanzen. Imp. Univ. Tokyo, Jour. Coll. Agr. **10**: 247–304. 1929.
587. NORMAN, A. G. A preliminary investigation of the development of structural constituents in the barley plant. Jour. Agr. Sci. **23**: 216–227. 1933.
588. NÖRNER, C. Beitrag zur Embryoentwicklung der Gramineen. Flora **64**: 241–251. 1881.
589. OLSON, P. J. A note on spring frost injury to cereal crops. Sci. Agr. **26**: 369–371. 1946.
590. ONO, T. [Fertile tetraploid barley obtained by the colchicine method. A preliminary note.] La Kromosomo **2**: 81–83. 1946. [Japanese]
591. ————. [A short report on polyploids in *Hordeum* and *Eleusine*.] Jap. Jour. Genet. **22**: 55–56. 1947. [Japanese] [Abs.]
592. ————. [Some properties of tetraploid barley.] Jap. Jour. Genet. **23**: 41–42. 1948. [Japanese] [Abs.]
593. ————. Statistical studies on right- and left-handed seedlings in two-rowed barley. Jap. Jour. Genet. **23**: 71–76. 1948. [Jap. with Eng. sum.]
594. ————. [Fertility of tetraploid barley.] Jap. Jour. Genet **24**: 81–82. 1949. [Japanese] [Abs.] [Eng. sum. provided by author]
595. ORLOV, A. A. The most important agronomical and botanical forms of barley (*Hordeum sativum* Jessen), studied on the background of the collection of barleys in the possession of the Institute of Plant Industry, and the principal varieties of spring barley in U.S.S.R. Bull. Appl. Bot., Genet. & Pl. Breed. **27**: 329–381. 1931. [Russ. with Eng. sum.]
596. ————. Barley—*Hordeum* L., pp. 97–332. Flora of Cultivated Plants. II. (Editor: Wulff, E. V.). State Agr. Pub. Co., Moscow-Leningrad. 447 pp. 1936.
597. PAO, W. K. and LI, W. H. Desynapsis and other abnormalities induced by high temperatures. Jour. Genet. **48**: 297–310. 1948.
598. PARK, J. B. Inheritance of lemma appendages in cultivated barley. Anat. Rec. **26**: 384. 1923. [Abs.]
599. PARKER, J. H. Hybrid or crossbred barley. Brewers Digest **21**: 51–57. 1946.
600. PATTERSON, E. K. The photodynamic action of neutral red on root tips of barley seedlings. I. The effect on frequency of cell division. Am. Jour. Bot. **28**: 628–638. 1941.
601. ————. The photodynamic action of neutral red on root tips of barley seedlings. II. Abnormalities of cells and tissue. Am. Jour. Bot. **29**: 109–121. 1942.

602. PEITEL, M. J. Zur Frage über das Enstehen neuer Gerstenformen durch natürliche Bastardierung. U.S.S.R. Cong. Genet., Pl. & An. Breed., Proc. Vol. 2: 381–391. 1930. [Russ. with Ger. sum.] PBA **1:** 534.

603. PELTIER, G. L. and KIESSELBACH, T. A. The comparative cold resistance of spring small grains. Jour. Am. Soc. Agron. **26:** 681–687. 1934.

604. PERAK, J. T. Numero de cromosomas de algunas especies de *Hordeum* espontaneas en Argentina. Anales Inst. Fitotec. Santa Catalina, 1941. **3:** 7–11. 1943.

605. PERCIVAL, J. The origin of barley. Suppl. Book of Dunns Farm Seeds. 2 pp. 1941.

606. PERSIDSKY, D. J. Embryological and cytological investigation of barley, *Hordeum distichum* L. Jour. Bot. Acad. Sci. RSS Ukraine **1**(3–4): 145–153. 1940. [Russ. with Eng. sum.]

607. PETERSON, R. F. *et al.* A diagrammatic scale for estimating rust intensity on leaves and stems of cereals. Canad. Jour. Res. C. **26:** 496–500. 1948.

608. PETO, F. H. The effect of aging and heat on the chromosomal mutation rates in maize and barley. Canad. Jour. Res. C. **9:** 261–264. 1933.

609. ————. Associations of somatic chromosomes induced by heat and chloral hydrate treatments. Canad. Jour. Res. C. **13:** 301–314. 1935.

610. ————. Heat induced tetraploidy in barley. Canad. Jour. Res. C. **14:** 445–447. 1936.

611. ————. Genetical studies on mutants in the progeny of heat-treated barley. Canad. Jour. Res. C. **15:** 217–229. 1937.

612. PISMENKO, P. A. [Mutations in barley induced by x-rays.] Jour. Inst. Bot. Acad. Sci. RSS Ukraine **13–14**(21–22): 95–108. 1937.

613. PISSAREV, V. E. *et al.* A haploid barley plant produced by remote hybridization. Compt. Rend. (Dok.) Acad. Sci. URSS **49:** 372. 1945.

614. PLATT, A. W. The effect of soil moisture, hardening, endosperm condition and variety on the frost reaction of wheat, oat and barley seedlings. Sci. Agr. **17:** 616–626. 1937.

615. PLOTNIKOV, J. G. [The technique of grafting of grain crops.] Yarovizatsia **3**(24): 63–65. 1939. [Russian]

616. PLOUGH, H. H. and IVES, P. T. Induction of mutations by high temperature in *Drosophila*. Genetics **20:** 42–69. 1935.

617. POEHLMAN, J. M. Sources of resistance to loose smut, *Ustilago nuda*, in winter barleys. Jour. Am. Soc. Agron. **39:** 430–437. 1947.

618. ————. Sources of resistance to loose smut, *Ustilago nuda*, in winter barleys of foreign origin. Agron. Jour. **41:** 191–194. 1949.

619. ————. Agronomic characteristics and disease resistance of winter barleys tested in Missouri, 1943 to 1948. Univ. Mo., Res. Bull. 442. 28 pp. 1949.

620. POPE, M. N. Catalase activity in relation to the growth curve in barley. Jour. Agr. Res. **44:** 343–355. 1932.

621. ————. The growth curve in barley. Jour. Agr. Res. **44:** 323–341. 1932.

622. ————. Catalase activity and respiration in the leaves of growing barley. Jour. Agr. Res. **46:** 35–40. 1933.

623. ————. A rapid method for making small grain hybrids. Jour. Am. Soc. Agron. **25:** 771–772. 1933.

624. ————. The production of barley seed through post-harvest pollination. Jour. Hered. **26:** 411–413. 1935.

625. ————. Fifteen years of selection in six varieties of barley. Jour. Am. Soc. Agron. **27:** 142–148. 1935.

626. ————. The time factor in pollen-tube growth and fertilization in barley. Jour. Agr. Res. **54:** 525–529. 1937.
627. ————. Viability of pollen and ovules of barley after cold storage. Jour. Agr. Res. **59:** 453–463. 1939.
628. ————. Artificially induced vivipary in barley. Jour. Am. Soc. Agron. **33:** 850–851. 1941.
629. ————. Rate of growth of the embryo of young barley seeds on excised culms. Jour. Am. Soc. Agron. **34:** 200–201. 1942.
630. ————. The temperature factor in fertilization and growth of the barley ovule. Jour. Agr. Res. **66:** 389–402. 1943.
631. ————. Cleavage polyembryony in barley. Jour. Hered. **34:** 153–154. 1943.
632. ————. Some notes on technique in barley breeding. Jour. Hered. **35:** 99–111. 1944.
633. ————. Seminal root number in cultivated barley. Jour. Am. Soc. Agron. **37:** 771–778. 1945.
634. ————. The course of the pollen tube in cultivated barley. Jour. Am. Soc. Agron. **38:** 432–440. 1946.
635. ————. Viviparous growth in immature barley kernels. Jour. Agr. Res. **78:** 295–309. 1949.
636. ———— and BROWN E. Induced vivipary in three varieties of barley possessing extreme dormancy. Jour. Am. Soc. Agron. **35:** 161–163. 1943.
637. PORTER, R. H. Effect of seed-borne pathogens and of seed disinfectants on the germination of barley seed. Assoc. Off. Seed Anal., Proc. **27:** 94–99. 1935.
638. POWERS, L. The nature of the interaction of genes affecting four quantitative characters in a cross between *Hordeum deficiens* and *vulgare*. Genetics **21:** 398–420. 1936.
639. ———— and HINES, L. Inheritance of reaction to stem rust and barbing of awns in barley crosses. Jour. Agr. Res. **46:** 1121–1129. 1933.
640. PRIDHAM, J. T. Oat and barley breeding, agricultural research in Australia. Adv. Coun. Sci., Ind. Commonw. Australia, Bull. **7:** 22–38. 1918. Bot. A. **5:** 1612.
641. PROSKOWETZ, E. v. Nutation und Begrannung in ihren correlativen Beziehungen und als züchterische Indices bei der langen zweizeiligen Gerste. Landw. Jahrb. **22:** 629–717. 1893.
642. PUGSLEY, A. T. and VINES, A. Breeding Australian barleys resistant to covered smut. Jour. Australian Inst. Agr. Sci. **12:** 44–47. 1946. PBA **17:** 30.
643. QUINCKE, F. L. Interspecific and intergeneric crosses with *Hordeum*. Canad. Jour. Res. C. **18:** 372–373. 1940.
644. RANDOLPH, L. F. An evaluation of induced polyploidy as a method of breeding crop plants. Am. Nat. **75:** 347–363. 1941.
645. ————. An evaluation of induced polyploidy as a method of breeding crop plants. Biol. Symp. **4:** 151–167. 1941.
646. RASUMOV, V. J. Über die photoperiodische Nachwirkung in Zusammenhang mit der Wirkung verschiedener Aussaattermine auf die Pflanzen. Planta **10:** 345–373. 1930.
647. RAUM, H. Vergleichende morphologische Sortenstudien an Gertreide Beiträge zur Eigenschaftsanalyse. IV. Winterweizen, Sommerweizen und Gerste. Zeits. Zücht. A. Pflanzensücht. **15:** 309–344. 1930.
648. REGEL, R. E. [Glattgrannige Gersten.] Bull. Appl. Bot., **1:** 5–85. 1908. [Russ. with Ger. sum.]
649. ————. [Ueber die Entstehung der glattgrannigen Gerste: *Hordeum vulgare* L. *rikotense Stassewitschi* M.]. Bull. Appl. Bot. **4:** 217–225. 1911. [Russ. with Ger. sum.]

650. ————. On the problem of the origin of the cultivated barley. Bull. App. Bot. **10:** 591–627. 1917. [Russ. with Eng. sum.]
651. Reid, D. A. A study of the inheritance of seedling and mature plant reaction to *Puccinia graminis tritici* in a cross of Wisconsin No. 38 × Peatland barley. Thesis (MS), Univ. Minn. 32 pp. 1938. [Typed]
652. Reznicuk, S. P. [Perennial rye (preliminary communication).] Sotsialist Zern, Khoz [Socialist Grain Farming] **4:** 87–90. PBA **9:** 1470. 1939.
653. Richards, B. L. Frost-banding of cereal seedlings. Utah Acad. Sci., Arts & Letters, Proc. **11:** 3–9. 1934.
654. Riddle, O. C. and Suneson, C. A. Crossing studies with male-sterile barley. Jour. Am. Soc. Agron. **36:** 62–65. 1944.
655. ———— and ————. Sources and use of scald resistance in barley. Jour. Am. Soc. Agron. **40:** 926–928. 1948.
656. Rimpau, W. Die Kreuzung als Mittel zur Erzeugung neuer Varietäten von landwirthschaftlichen Kulturpflanzen. Landw. Vers. Sta. **31:** 171–182. 1885.
657. ————. Kreuzungsprodukte landwirtschaftlicher Kulturpflanzen. Landw. Jahrb. **20:** 335–371. 1891.
658. ————. Die genetische Entwicklung der verschiedenen Formen unserer Saatgerste. Landw. Jahrb. **21:** 699–702. 1892.
659. ————. Über Kreuzungsprodukte von Getreide. Beitr. Pflanzenzücht. **2:** 115–129. 1912.
660. Robertson, D. W. Linkage studies in barley. Genetics **14:** 1–36. 1929.
661. ————. Inheritance in barley. VI Int. Congr. Genet., Proc. Vol. 2: 170–171. 1932.
662. ————. The effect of a lethal in the heterozygous condition on barley development. Col. Agr. Exp. Sta., Tech. Bull. 1. 12 pp. 1932.
663. ————. Inheritance in barley. Genetics **18:** 148–158. 1933.
664. ————. Maternal inheritance in barley. Genetics **22:** 104–113. 1937.
665. ————. Inheritance in barley. II. Genetics **22:** 443–451. 1937.
666. ————. Genetics of barley. Jour. Am. Soc. Agron. **31:** 273–283. 1939.
667. ———— and Austin, W. W. The effect of one and of two seedling lethals in the heterozygous condition on barley development. Jour. Agr. Res. **51:** 435–440. 1935.
668. ———— and Coleman, O. H. The addition of two factor pairs for chlorophyll-deficient seedlings to the linkage groups of barley. Jour. Genet. **39:** 401–410. 1940.
669. ———— and ————. Location of glossy and yellow seedlings in two linkage groups. Jour. Am. Soc. Agron. **34:** 1028–1034. 1942.
670. ———— and Deming, G. W. Genetic studies in barley. Jour. Hered. **21:** 283–288. 1930.
671. ———— and ————. Natural crossing in barley at Fort Collins, Colorado. Jour. Am. Soc. Agron. **23:** 402–406. 1931.
672. ———— *et al.* Inheritance in barley. Jour. Agr. Res. **44:** 445–466. 1932.
673. ———— *et al.* The location of two genes for mature plant characters in barley in linkage group No. 1. Jour. Am. Soc. Agron. **36:** 66–72. 1944.
674. ———— and Lute, A. M. Germination of the seed of farm crops in Colorado after storage for various periods of years. Jour. Agr. Res. **46:** 455–462. 1933.

675. ———— *et al.* Germination of 20-year-old wheat, oats, barley, corn, rye, sorghum, and soybeans. Jour. Am. Soc. Agron. **35:** 786–795. 1943.
676. ———— *et al.* A summary of linkage studies in barley. Jour. Am. Soc. Agron. **33:** 47–64. 1941.
677. ———— *et al.* A summary of linkage studies in barley: Suppl. 1, 1940–1946. Jour. Am. Soc. Agron. **34:** 464–473. 1947.
678. ROEMER, T. *et al.* Die Züchtung resistenter Rassen der Kulturpflanzen. Kühn-Archiv **45:** 1–427. 1938.
679. ROSENDAHL, G. Cytologische Untersuchungen an tetraploiden Gersten. Kühn-Archiv **60:** 238–252. 1943–1944.
680. ROSENQUIST, C. E. An improved method of producing F_1 hybrid seeds of wheat and barley. Jour. Am. Soc. Agron. **19:** 968–971. 1927.
681. Ross, J. G. *et al.* Factors affecting the degree of infection of barley by loose smut (*Ustilago nuda* (Jens)). Rostr. Sci. Agr. **28:** 481–492. 1948.
682. RUGE, U. Versuche zur Beeinflussung der Nachreife der Sommergerste. Züchter **17/18:** 59–62. 1946.
683. RUNEHJELM, D. Mikro-Eisen-Bestimmungen an chlorophyll-defekten Blättern. Biochem. Zeits. **224:** 481–486. 1930.
684. RUPPERT, F. D. Inheritance of winter and spring habits in barley. Jour. Am. Soc. Agron. **17:** 656. 1925. [Abs.]
685. RUTTLE, M. L. and NEBEL, B. R. Chromosome structure. XI. *Hordeum vulgare* L. and *Secale cereale* L. Cytolgia, Fujii Jubilee Vol.: 553–568. 1937.
686. SAKAI, K. Diurnal periodicity of somatic mitoses in the root-tips of several crop plants. Jap. Jour. Genet. **17:** 35–40. 1941. [Jap. with Eng. sum.]
687. SASAKI, T. [On the preservation of the pollen of cultivated plants.] Jour. Sci. Agr. Soc. Japan **212:** 257–278. 1920. [Japanese]
688. ————. The preservation of the pollen of cereals. Jour. Sci. Agr. Soc. Japan **275:** 259–287. 1925. [Jap. with Eng. sum.]
689. ————. On the preservation of the pollen of cereals. Proc. Imp. Acad. Tokyo **3:** 191–193. 1927.
690. SAULI, J. O. Die Finnischen Landgersten und ihr züchterischer Wert. Suomen Maataloust. Seuran Julk. **18:** 139 pp. 1927. [Finnish with Ger. sum.]
691. SAUNDERS, C. E. and MOE, G. G. Some observations on the inheritance of awns and hoods in barley. Royal Soc. Canada, Proc. & Trans. (3) Sect. 5. **16:** 15–26. 1922.
692. SAVINSKAJA, V. F. [A case of natural hybridization in barley.] [Hybridization News] **2:** 106–107. 1941. [Russian]
693. SCHALLER, C. W. Loose smut of barley. Thesis (PhD), Univ. Wis. 101 pp. 1946. [Typed]
694. SCHARNAGEL, T. Über die Entstehung einer eigenartigen Abnormität als konstante neue Rasse bei Gerste. Zeits. Ind. Abs. Ver. **38:** 134–140. 1925.
695. SCHIEMANN, E. Ergebnisse der Bastardierungsversuche bei Gerste. Sitzber. Ges. Naturf. Freunde **1917:** 385–403. 1917.
696. ————. Zur Frage der Brüchigkeit der Gerste—eine Berichtigung. Zeits. Ind. Abs. Ver. **21:** 53. 1919.
697. ————. Ueber die Erblichkeit einer Anomalie bei Gerste. Sitzber. Ges. Naturf. Freunde **1921:** 53–55. 1921.
698. ————. Genetische Studien an Gerste. I. Zur Frage der Brüchigkeit der Gerste. Zeits. Ind. Abs. Ver. **26:** 109–143. 1921.
699. ————. Genetische Studien an Gerste. II. Zur Genetik der breitklappigen Gersten. Zeits. Ind. Abs. Ver. **27:** 104–133. 1921.

700. ————. Genetische Studien zur Sortenunterscheidung der Gerste. Zeits. Ind. Abs. Ver. **30:** 293–296. 1923.
701. ————. Zur Genetik des Sommer- und Wintertypus bei Gerste. Zeits. Ind. Abs. Ver. **37:** 139–209. 1925.
702. ————. Entstehung der Kulturpflanzen. Handbuch Vererbungwiss. **3**(1B, Gerste): 161–175. 1932.
703. ————. Über eine praktisch und phylogenetisch wichtige Mutation bei Gerste nebst einigen Bemerkungen über Mutation bei Getreide. Ber. Deut. Bot. Ges. **48:** 477–489. 1930.
704. ————. Neue Probleme der Gerstenphylogenie. Züchter **11:** 145–147. 1939.
705. ————. Weizen, Roggen, Gerste Systematik, Geschichte und Verwendung. 102 pp. 1948.
706. SCHNEIDER, E. Untersuchungen über eine neue luxurierende Gerstenform. Zeits. Pflanzenzücht. **1:** 301–322. 1913.
707. SCHULZ, K. G. Zwillingsbildung bei Nacktgersten. Wochens. Brauerei **52:** 353–354. 1936.
708. SCHWARTZ, P. A. Anatomical and cytological changes in seedlings from chemically treated cereal grain. Compt. Rend. (Dok.) Acad. Sci. **28:** 354–456. 1940. [Russian]
709. SHALYGIN, I. Genetic analysis of albinism mutations induced in barley by x-radiation. Compt. Rend. Acad. Sci. URSS **25:** 60–63. 1939. PBA **10:** 440.
710. SHANDS, H. L. Temperature studies on stripe of barley. Phytopath. **24:** 364–383. 1934.
711. SHANDS, R. G. Chevron, a barley variety resistant to stem rust and other diseases. Phytopath. **29:** 209–211. 1939.
712. ————. An apparent linkage of resistance to loose smut and stem rust in barley. Jour. Am. Soc. Agron. **38:** 690–692. 1946.
713. ———— *et al.* Stripe resistance and yield of smooth-awned barley hybrids. Univ. Wis. Agr. Exp. Sta., Res. Bull. 116. 22 pp. 1933.
714. SHISHKOFF, D. and KOSTOFF, D. The influence of various contents of sand in the soil upon the development of diploid barley, diploid millet and tetraploid millet. Bull. Cham. Cult. Nat'l. Ser. Biol., Agr. Silv. USSR **1**(2): 457–462. 1947.
715. SHMUCK, A. and GUSSEVA, A. Chemical structure of substances inducing polyploidy in plants. Compt. Rend. (Dok.) Acad. Sci. URSS **24:** 441–446. 1939.
716. SIGFUSSON, S. J. Correlated inheritance of glume color, barbing of awns and length of rachilla hairs in barley. Sci. Agr. **9:** 662–674. 1929.
717. SIMMONDS, P. M. Detection of the loose smut fungi in embryos of barley and wheat. Sci. Agr. **26:** 51–58. 1946.
718. SIMONET, M. and FARDY, A. Tétraploide chez l'orge nue à deux rangs (*Hordeum distichum* L. var. *nudum*. L. $2n = 14$). Provoquée par l'action de la colchicine sur le coléoptile. Rev. Sci., Paris **81:** 453–454. 1943. PBA **16:** 766.
719. ———— et IGOLEN, G. Action de quelques dérivés de la quinoléine sur la mitose de l'orge. Compt. Rend. Soc. Biol., Paris **138:** 234–235. 1944.
720. SMITH, D. C. Intergeneric hybridization of cereals and other grasses. Jour. Agr. Res. **64:** 33–47. 1942.
721. ————. Intergeneric hybridization of *Triticum* and other grasses, principally *Agropyron*. Jour. Hered. **34:** 219–224. 1943.
722. ————. Pollination and seed formation in grasses. Jour. Agr. Res. **68:** 79–95. 1944.
723. SMITH, H. S. The inheritance of seed color in the cross *Hordeum intermedium cornutum* × *Hordeum distichon nudum*. Thesis (MS), Col. A. & M. Coll. 29 pp. 1940. [Typed]

724. SMITH, J. H. C. Organic compounds of magnesium and phosphorus in relation to chlorophyll formation. Jour. Am. Chem. Soc. **69:** 1492–1496. 1947.
725. SMITH, L. An inversion, a reciprocal translocation, trisomics, and tetraploids in barley. Jour. Agr. Res. **63:** 741–750. 1941.
726. ————. Cytogenetics of a factor for multiploid sporocytes in barley. Am. Jour. Bot. **29:** 451–456. 1942.
727. ————. Relation of polyploidy to heat and X-ray effects in the cereals. Jour. Hered. **34:** 131–134. 1943.
728. ————. A comparison of the effects of heat and X-rays on dormant seeds of cereals, with special reference to polyploidy. Jour. Agr. Res. **73:** 137–158. 1946.
729. ————. The acetocarmine smear technic. Stain Tech. **22:** 17–31. 1947.
730. ————. The effect of chaff of cereals on germination of seeds and on the growth of mold. Jour. Am. Soc. Agron. **40:** 32–44. 1948.
731. ————. A haplo-viable deficiency-duplication from an interchange in *Triticum monococcum*. Bot. Gaz. **109:** 258–268. 1948.
731*a*. ————. Effects of atomic bomb radiations and X-rays on seeds of cereals (A comparison of the effects of ionizing radiations from the "test able" atomic bomb and from X-rays on seeds of barley, wheat and oats). Jour. Hered. **41:** 125–130. 1950.
732. ———— and CALDECOTT, R. S. Modification of X-ray effects on barley seeds by pre- and post-treatment with heat. Jour. Hered. **39:** 173–176. 1948.
733. SMITH, O. E. A cytogenetic study of two translocations in barley. Thesis (MS), Univ. Neb. 28 pp. 1949. [Typed]
734. So, M. [On the inheritance of variegation of barley.] Jap. Jour. Genet. **1:** 21–36. 1921. [Japanese]
735. ———— and IMAI, Y. On the xenia of the barley. Bot. Mag., Tokyo **32:** 205–214. 1918.
736. ———— *et al.* [A linkage group in barley.] Jour. Sci. Agr. Soc. Japan **208:** 1093–1117. 1919. [Japanese]
737. ———— *et al.* [On the complemental and multiple factors and their linkage in barley.] Jour. Sci. Agr. Soc. Japan **209:** 27–60. 1920. [Japanese]
738. ———— *et al.* [On variegation in radish, morning glory and barley. Preliminary report.] Jour. Sci. Agr. Soc. Japan **208:** 1065–1078. 1919. [Japanese]
739. SOLOVEI, G. T. [The nature of changes in spring barley into winter form.] Yarovizatzia **4:** 70–71. 1939. [Russian]
740. SPINKS, J. W. T. *et al.* Lethal effect of absorbed radioisotopes on plants. Canad. Jour. Res. C. **26:** 249–262. 1948.
741. SSARANA, M. [The shortening of the chromosomes under the influence of cold in cereals.] Zeits. Ang. Bot. (5–6): 15–22. 1930. PBA **2:** 293.
742. STADLER, L. J. Mutations in barley induced by x-rays and radium. Science **68:** 186–187. 1928.
743. ————. The rate of induced mutation in relation to dormancy, temperature, and dosage. Anat. Rec. **41:** 97. 1928. [Abs.]
744. ————. Some genetic effects of X-rays in plants. Jour. Hered. **21:** 3–19. 1930.
745. ————. The experimental modification of heredity in crop plants. II. Induced mutation. Sci. Agr. **11:** 645–661. 1931.
746. ————. Induced mutations in plants. Biological effects of radiation. Editor: B. M. Duggar. Vol. 2: 1263–1280. 1936.
747. STÄHLIN, A. Morphologische und zytologische Untersuchungen an Gramineen. Wiss. Arch. Landw. A. Pflanzenbau. **1:** 330–398. 1929.

748. STANFORD, E. H. and BRIGGS, F. N. Two additional factors for resistance to mildew in barley. Jour. Agr. Res. **61:** 231–236. 1940.
749. STAUDT, G. A bibliography of genetic research published in Germany, 1942–1944. Heredity **1:** 379–388. 1947.
750. STEBBINS, G. L., JR. and LOVE, R. M. A cytological study of California forage grasses. Am. Jour. Bot. **28:** 371–382. 1941.
751. ———— and STEINITZ, L. M. The effect of anaerobic conditions on mitosis in seedlings of *Hordeum*. Am. Jour. Bot. **26:** 674. 1939. [Abs.]
752. ———— *et al.* Artificial and natural hybrids in the Gramineae tribe Hordeae. II. *Agropyron, Elymus* and *Hordeum*. Am. Jour. Bot. **33:** 579–586. 1946.
753. STEINITZ, L. M. The effect of lack of oxygen on mitosis in barley. Am. Jour. Bot. **30:** 622–626. 1943.
754. STEVENSON, F. J. Natural crossing in barley. Jour. Am. Soc. Agron. **20:** 1193–1196. 1928.
755. STOLZE, K. V. Die Chromosomenzahlen der hauptsächlichsten Getreidearten nebst allgemeinen Betrachtungen über Chromosomen, Chromosomenzahl und Chromosomengrösse im Pflanzenreich. Bib. Genet. **8:** 1–71. 1925.
756. STRAIB, W. Über Resistenz bei Gerste gegenüber Zwergrost und Gelbrost. Züchter **9:** 305–311. 1937.
757. ————. Über die Vererbung des Verhaltens der Gerste gegenüber Gelbrost. Züchter **12:** 115–120. 1940.
758. ————. Über die Vererbung des Verhaltens der Gerste gegenüber Gelbrost. II. Züchter **16:** 64–67. 1946.
759. STUBBE, H. and BANDLOW, G. Mutationsversuche an Kulturpflanzen. I. Röntgenbestrahlungen von Winter- und Sommergersten. Züchter **17/18:** 365–374. 1947.
760. STUCH, P. [Strength of culms of cereals as affected by fertilizers and other factors.] Zeits Pflanzenernähr., Düngung **7**(5–6) : 257–290. 1926. ESR **57:** 327.
761. SUGAWARA, T. Studies on the formation of ascorbic acid (vitamin C) in plants. I. The influence of light on the ascorbic acid contents in various etiolated seedlings. Jap. Jour. Bot. **10:** 141–150. 1939.
762. ————. Studies on the formation of ascorbic acid (vitamin C) in plants. II. The influence of radiation of different wave-lengths on the ascorbic acid contents in etiolated seedlings. Jap. Jour. Bot. **10:** 325–333. 1939.
763. ————. Studies on the formation of ascorbic acid (vitamin C) in plants. IV. Daily variation of ascorbic acid content and the concentration of carbohydrate in the leaves of plants. Jap. Jour. Bot. **11:** 343–356. 1941.
764. SUNESON, C. A. A male sterile character in barley. A new tool for the plant breeder. Jour. Hered. **31:** 213–214. 1940.
765. ————. The use of male-sterile in barley improvement. Jour. Am. Soc. Agron. **37:** 72–73. 1945.
766. ———— and HOUSTON, B. R. Male-sterile barley for study of floral infection. Phytopath. **32:** 431–432. 1942.
767. ———— and RIDDLE, O. C. Hybrid vigor in barley. Jour. Am. Soc. Agron. **36:** 57–61. 1944.
768. ———— and SANTONI, S. C. Barley varieties resistant to stripe, *Helminthosporium gramineum* Rabh. Jour. Am. Soc. Agron. **35:** 736–737. 1943.
769. ———— and WIEBE, G. A. Survival of wheat and barley varieties in mixtures. Jour. Am. Soc. Agron. **34:** 1052–1056. 1942.
770. SWENSON, S. P. Genetic and cytologic studies of a brachytic mutation in barley. Jour. Agr. Res. **60:** 687–713. 1940.

771. ————. Differential injury by grasshoppers on varieties of wheat, barley, and oats. [Unpub. paper presented at a meeting of the Am. Soc. Agron., Chicago, 1940]
772. ————. Washington Agr. Exp. Sta., 54th Ann. Rept., Bull. 455: 12–13. 1944.
773. ———— and WELLS, D. G. The linkage relation of four genes in chromosome I of barley. Jour. Am. Soc. Agron. **36:** 429–435. 1944.
774. SYAKUDO, K. Studies on the quantitative inheritance (4). B. Barley (*Hordeum sativum*) (a). Inheritance of the awn length and the quantitative function of the causal genes in their length determination. I. On the quantitative function of the four inhibitors and the genes N1, N2, and M. Jap. Jour. Genet. **23:** 85–90. 1948. [Japanese]
775. TAKAHASHI, N. On the inheritance of the spring versus winter form in barley. Jap. Jour. Genet. **3:** 22–28. 1924. [Jap. with Eng. sum.]
776. ————. Studies on the inheritance of the spring and winter growing habit in crosses between spring and winter barleys. Chosen Agr. Exp. Sta., Bull. Gov.-Gen. **2:** 1–7. 1925.
777. TAKAHASHI, R. Studies on the classification and the geographical distribution of the Japanese barley varieties. I. Significance of the bimodal curve of the coleoptile length. Ber. Ohara Inst. Landw. Forsch. **9:** 71–90. 1942.
778. ————. List of literature on barley. Ber. Ohara Inst. Landw. Forsch. **9:** 259–316. 1943.
779. ————. [Studies on the classification and the geographical distribution of the Japanese barley varieties. V. Inheritance of the length of coleoptiles and its meaning in breeding.] [Agronomic Researches] **37:** 102–108. 1947. [Japanese]
780. ————. [Studies on the classification and the geographical distribution of the Japanese barley varieties. VI. Rachilla hairs.] [Agronomic Researches] **37:** 132–136. 1947. [Jap. with Eng. trans. by S. Ebi provided by W. H. Leonard]
781. ————. [Studies on the classification and the geographical distribution of the Japanese barley varieties. VIII. Shattering of seeds.] [Agronomic Researches] **38:** 41–43. 1949. [Japanese]
782. ————. [Studies on the classification and the geographical distribution of the Japanese barley varieties. IX. Variations in awns.] [Agronomic Researches] **38:** 77–80. 1949. [Japanese]
783. ————. [Studies on the semi-brachytic form of barley in Japan.] Ohara Inst. Agr. Res. [Author's Eng. sum provided by W. H. Leonard]
784. ———— and ITANO, Y. [The quality of the awn of Japanese barley and its relation to the content of ash constituents in the awn. Preliminary report.] [Agronomic Researches] 37. 1947. [Jap. with Eng. trans. by S. Ebi provided by W. H. Leonard]
785. ———— and ————. [Studies on the characteristics of young barley. II. The angle formed by the seminal root and its difference among varieties.] [Agronomic Researches] **37:** 71–73. 1947. [Jap. with Eng. trans. provided by W. H. Leonard]
786. ———— *et al.* [Studies on the classification and the geographical distribution of the Japanese barley varieties. VII. Hairs on leaf sheaths.] [Agronomic Researches] **38:** 5–10. 1948. [Japanese]
787. TAKASUGI, S. [The distinction which can be demonstrated between the Japanese barley varieties by treating the grains with carbolic acid, sulphuric acid, or caustic soda solution.] [Agron. & Hort.] **12:** 1101–1105. 1937. [Japanese]

788. TAKEZAKI, Y. [On the genetical formulae of the length of spikes and awns in barley, with reference to the computation of the valency of the hereditary factor.] Rep. Agr. Exp. Sta., Tokyo **46**: 1–43. 1927. [Japanese]

789. ————. The inheritance of the ear-length and awn-length in barley, with special reference to their factor analysis and the determination of their qualifying value. V Int. Kong. Vererbungswiss., Berlin, 1927 Verhandl. Vol. 2: 1447–1454. 1928.

790. TANJI, S. Chromosome numbers of wild barley. Bot. Mag., Tokyo **30**: 55–57. 1925.

791. TASCHER, W. R. Experiments with x-ray treatments on the seeds of certain crop plants. Thesis (PhD), Univ. Missouri. 37 pp. 1929. [Typed]

792. ————. Experiments on the control of seed-borne diseases by x-rays. Jour. Agr. Res. **46**: 909–915. 1933.

793. TAVCAR, A. Winterfestigkeit und genetisch bedingte Tieflage der Vegetationspunkte an Getreidepflanzen. Zeits. Zücht. A. Pflanzenzücht. **15**: 63–73. 1930.

794. ————. Vererbungsart braungelber Spelzenfarbe bei der Gerste. Archiv State Dept. Agr., Beograd Somotra Naucn. **3**: 3–8. 1936. [Yugoslav with Ger. sum.]

795. ————. Vererbungsart der Spindelstufenzahl bei Bastardierungen einiger *distichum vulgare* Wintergersten. Zeits. Ind. Abs. Ver. **75**: 106–123. 1938.

796. ————. Abfallende Grannen bei *Hordeum sativum* L.—Vererbungsart und züchterische Bedeutung. [Rev. Sci. Agr., Zagreb] **1**: 3–17. 1939. [Yugoslav with Ger. sum.]

797. ————. Züchtung nackter Wintergerste durch Bastardierung. [Rev. Sci. Agr., Zagreb.] **3**: 3–17. 1941. [Yugoslav with Ger. sum.]

798. ————. Beitrag zur Vererbung der Spindelbrüchigkeit bei einigen Nacktgersten. Zeits. Pflanzenzücht. **24**: 333–338. 1941.

799. ————. Doppelt-rezessiver Erbgang des Merkmals "abfallende Grannen" bei Gerste. [Rev. Sci. Agr., Zagreb] **6**: 3–14. 1942. [Yugoslav with Ger. sum.]

800. ————. [The inheritance of the firmness of the spikelets on naked barley, *H. sativum nudum*.] [Rev. Sci. Agr., Zagreb] **8**: 41–56. 1944. PBA **16**: 1263.

801. ————. The inheritance of earliness in winter barley—*Hordeum sativum* Jess. [Rev. Sci. Agr., Zagreb] **10/11**: 1–8. 1948. [Yugoslav with Eng. sum.]

802. TAYLOR, J. W. and HARLAN, H. V. Agronomic smut. Jour. Hered. **34**: 309–310. 1943.

803. TEDIN, H. [Is protein content of barley a variety characteristic?] Sverig. Utsädesfören. Tids. **16**: 177–187. 1906. [Swedish]

804. ————. [Tillering ability in barley.] Sverig. Utsädesfören. Tidskr. **19**: 292–312. 1909. [Swedish]

805. ————. [The genetics of the base of the kernel and its relationship to the density of the spike in barley.] Sverig. Utsädesfören. Tids. **38**: 42–45. 1928. [Swedish]

806. ———— and TEDIN, O. Contributions to the genetics of barley. I. Type of spike, nakedness and height of plant. Hereditas **7**: 151–160. 1926.

807. ———— and ————. Contributions to the genetics of barley. II. The development of the kernel basis and its relation to density. Hereditas **9**: 303–312. 1927.

808. TEDIN, O. Contributions to the genetics of barley. III. Development of the lateral florets. Hereditas **12**: 352–357. 1929.

809. TERAO, H. and IKEDA, T. Twin-budded plants of wheat and barley. Agron. & Hort. **9**: 751–755. 1934. [Jap. with Eng. sum.]
810. THARP, W. H. Developmental anatomy and relative permeability of barley seed coats. Bot. Gaz. **97**: 240–271. 1935.
811. THATCHER, L. E. U. S. Dept. Agr., Yrbk., p. 344. 1936.
812. THATCHER, R. W. Dominant and recessive characters in barley and oat hybrids. Proc. Soc. Prom. Agr. Sci. **33**: 37–50. 1912.
813. THELLUNG, A. Ein neuer, in Schweden gefundener *Hordeum*-Bastard (*H. comosum* × *jubatum* var. *pampeanum*—*H. Blomii*). Bot. Not. **1927**: 191–194. 1927.
814. THOMPSON, W. P. The frequency of fertilization and the nature of embryo and endosperm development in intergeneric crosses in cereals. VII Int. Congr. Genet., Proc. 1939. [Abs.]
815. ————. The causes of hybrid sterility and incompatibility. Trans. Royal Soc. Canada, III, Sect. 5. **34**: 1–13. 1940.
816. ———— and JOHNSTON, D. The cause of incompatibility between barley and rye. Canad. Jour. Res. C. **23**: 1–15. 1945.
817. THUNAEUS, H. [New varieties of malting barley by means of x-irradiation.] Svensk Bryggeritidskrift **61**: 73–83. 1946. PBA **17**: 201.
818. TIDD, J. S. Studies concerning the reaction of barley to two undescribed physiologic races of barley mildew, *Erysiphe graminis hordei* Marchal. Phytopath. **27**: 51–68. 1937.
819. ————. Inheritance of resistance of barley to an undescribed physiologic form of *Erysiphe graminis hordei*. Phytopath. **27**: 141–142. 1937. [Abs.]
820. ————. Inheritance of resistance to *Erysiphe graminis hordei* in a cross between Featherstone and Nepal barley. Phytopath. **30**: 24–25. 1940. [Abs.]
821. TISCHLER, G. v. Pflanzliche Chromosomenzahlen. Tab. Biol. **4**: 1–83. 1927.
822. ————. Pflanzliche Chromosomenzahlen. Tab. Biol. **7**: 109–226. 1931.
823. ————. Pflanzliche Chromosomenzahlen. Tab. Biol. **11**: 281–304. 1935.
824. ————. Pflanzliche Chromosomenzahlen. Tab. Biol. **12**: 57–115. 1936.
825. ————. Pflanzliche Chromosomenzahlen. Tab. Biol. **16**: 162–218. 1938.
826. TODARO, F. Concerning the duration of the germinative ability of the seed of various cultivated plants. Staz. Sper. Agr. Ital. **31**: 525–563. 1898.
827. TOKHTUYEV, A. V. Albinism in barley. Bull. Appl. Bot., Genet. & Pl. Breed. II. **9**: 307–309. 1936. [Russ. with Eng. sum.]
828. ————. A new mutation in barley—absence of waxy bloom on the leaves. Bull. Appl. Bot., Genet. & Pl. Breed. II. **9**: 361–366. [Russ. with Eng. sum.]
829. ————. Inheritance of the length of growing period in barley. Compt. Rend. (Dok.) Acad. Sci. URSS **27**: 147–150. 1940.
830. TOMETORP, G. Cytological studies on haploid *Hordeum distichum*. Hereditas **25**: 241–254. 1939.
831. TSCHERMAK, E. v. Ueber Züchtung neuer Getreiderassen *mittelst* künstlicher Kreuzung. Kritisch-historische Betrachtungen. Zeits. Landw. Versuchs. Oesterr. **4**: 1029–1060. 1901.
832. ————. Die praktische Verwertung des mendelschen Vererbungsgesetzes bei der Züchtung neuer Getreiderassen. Deut. Landw. Presse **30**: 712–713. 1903.

833. ————. Die Blüh- und Fruchtbarkeitsverhältnisse bei Roggen und Gerste und das Auftreten von Mutterkorn. Landw. Zeitung **55:** 194–199. 1906.
834. ————. Über seltene Getreidebastarde. Beiträge Pflanzenzücht. **3:** 49–61. 1913.
835. ————. Die Verwertung der Bastardierung für phylogenetische Frage in der Getreidegruppe. Zeits. Pflanzenzücht. **2:** 291–312. 1914.
836. ————. Über die Vererbungsweise von Art- und Gattungsbastarden innerhalb der Getreidegruppe. Mitt. Landw. Lehrkanzeln Hochschule Bodenkultur Wien. **2:** 763–772. 1914.
837. ————. Bastardierung (von Gerste). Handbuch Landw. Pflanzenzücht. von Fruwirth, C. **44:** 309–326. 1923.
838. ————. Praktische und theoretische Ergebnisse auf dem Gebiete der Gerstenbastardierung. Zeits. Pflanzenzücht. **12:** 370–380. 1927.
839. TSCHERMAK-SEYSENEGG, E. v. Wie erhält man bei Getreidekreuzungen einen besseren Kornansat? Züchter **13:** 193–195. 1941. BA **22:** 19850.
840. TUMANOV, I. I. and BORODIN, I. Investigations on frost resistance of winter crops by means of direct freezing and of indirect methods. Bull. Appl. Bot., Genet. & Pl. Breed. **22:** 395–440. 1929. [Russ. with Eng. sum.]
841. UBISCH, G. v. Analyse eines Falles von Bastardatavismus und Faktorenkoppelung bei Gerste. Zeits. Ind. Abs. Ver. **14:** 226–237. 1915.
842. ————. Beitrag zu einer Faktorenanalyse von Gerste. Zeits. Ind. Abs. Ver. **17:** 120–152. 1916.
843. ————. Gerstenkreuzungen. Landw. Jahrb. **53:** 191–244. 1919.
844. ————. Beitrag zu einer Faktorenanalyse von Gerste. II. Zeits. Ind. Abs. Ver. **20:** 65–117. 1919.
845. ————. Beitrag zu einer Faktorenanalyse von Gerste. III. Zeits. Ind. Abs. Ver. **25:** 198–210. 1921.
846. ————. Beitrag zu einer Faktorenanalyse von Gerste. IV. Ber. Deut. Bot. Ges. **41:** 79–84. 1923.
847. UMEYA, Y. Studies on the vigor of silkworms, *Bombyx mori* L. Genetics **15:** 189–204. 1930.
848. UCHIDA, O. Spontaneous mutants found in rice, wheat and barley. Agron. & Hort. **22**(2–3). 1947. [Abs. provided by W. H. Leonard]
849. VALLEGA, J. and FAVRET, E. A. Herencia de la resistencia a *Erysiphe graminis hordei* en cebada I. Factores de resistencia en las variedades Monte Cristo y Nigrate. Revista Inv. Agr. **1:** 81–91. 1947.
850. VANTERPOOL, T. C. Chlorotic banding of cereal seedlings. Sci. Agr. **29:** 334–339. 1949.
851. VANHA, J. *et al.* Welcher Einfluss hat die chemische Zusammensetzung des Gerstenkorns auf die Entwicklung, Qualität und das Productionsvermögen der Gerste und wie vererben sich diese Eigenschaften. Zeits. Landw. Versuchs. Oesterr. **8:** 667–684. 1905.
852. VAVILOV, N. I. Immunity to fungus diseases as a physiological test in genetics and systematics, exemplified in cereals. Jour. Genet. **4:** 49–65. 1914.
853. ————. Immunity of plants to infectious diseases. Bull. Petrovsk Agr. Acad. 1918. 239 pp. 1919. [Russ. with Eng. sum.]
854. ————. De l'origine d'orge a barbes lisses. Bull. Appl. Bot., Pl. Breed. **12:** 53–128. 1921. [Russ. with Fr. sum.]
855. ————. Studies on the origin of cultivated plants. Bull. Appl. Bot., Genet. & Pl. Breed. **16**(2): 1–248. 1926. [Russ. with Eng. sum.]
856. ———— and KOUZNETSOVA, E. S. On the genetic nature of winter and spring varieties of plants. Bull. Agron. Faculty Saratov. Univ. **1:** 1–25. 1921. [Russ. with Eng. sum.]

857. ———— and ————. The genetic nature of winter and spring varieties of plants. Ann. Inst. Agron. Saratov. **1:** 17–41. 1923. [Russ. with Eng. sum.]
858. VEIDEMAN, M. G. A contribution to the genetics and morphology of barley. On the genetic nature of the lateral spikelets of barley. Bull. Appl. Bot. Genet. & Pl. Breed. **17**(2): 3–70. 1927. [Russ. with Eng. sum.]
859. VESTERGAARD, H. A. B. [Observations on chlorophyll-deficient barley plants.] Tids. Landb. Planteav. **21:** 151–154. 1914. [Danish]
860. ————. [Observations on various barley characters.] Tids. Landb. Planteav. **22:** 336–348. 1915. [Danish]
861. ————. [Observation on inheritance in lupines, wheat and barley.] Tids. Landb. Planteav. **26:** 491–510. 1919. **ESR** 42: 133–135.
862. ————. Beobachtungen vom Zuchtgarten. Zeits. Pflanzenzücht. **8:** 192–195. 1921.
863. ————. Abed Planteavlsstation. Foraedlingsarbejdet gennem 25 Aar. 80 pp. 1928. [Danish]
864. VIK, K. and LUNDEN, A. P. [Inheritance of length of internode in the rachis and some other characters in a cross between two barley varieties.] Meld. Norges Landbr. **8:** 249–266. 1928. [Norwegian with Eng. sum.]
865. VINES, A. Studies on the germination of barley grains. Australian Jour. Exp. Biol. & Med. Sci. **25:** 119–126. 1947.
866. VINOGRADOVA, N. M. [Hybridization between cultivated barley and wild species of *Hordeum*.] Trudy Zonal. Inst. Zernovovo Khoziaistva Nechernozemnoi Polosy SSSR **13:** 134–137. 1946. [Russ., Eng. Abs. provided by G. L. Stebbins, Jr.]
867. ———— and PISAREV, V. E. Hybridization of cultivated barley with wild barleys. Vest. Akad. Nauk. SSR Rec. Acad. Sci. USSR **4 & 5:** 65–66. 1944. PBA **15:** 1405.
868. WADDOUPS, H. M. A study of semisterility and its linkage relationships in translocation stocks of barley. Thesis (MS), Utah State Agr. Coll. 66 pp. 1949. [Typed]
869. WAGNER, N. Über die Entwicklungsmechanik der Wurzelhaube und des Wurzelrippenmeristems. Planta **30:** 21–66. 1939.
870. WALSTER, H. L. Formative effect of high and low temperatures upon growth of barley: a chemical correlation. Bot. Gaz. **69:** 97–126. 1920.
871. WALWORTH, E. H. and SMITH, L. H. Variation in the development of secondary rootlets in cereals. Jour. Am. Soc. Agron. **10:** 32–35. 1918.
872. WANG, S. Inheritance in barley. Jour. Agr. Assoc. China **148:** 1–16. 1936. [Chinese with Eng. sum.]
873. WARNER, M. F. *et al.* A bibliography of plant genetics. U. S. Dept. Agr., Misc. Pub. 164. 552 pp. 1934.
874. WATERHOUSE, W. L. Studies in the inheritance of resistance to leaf rust, *Puccinia anomala* Rostr., in crosses of barley. I. Royal Soc. New South Wales, Jour. & Proc. **61:** 218–247. 1927.
875. ————. Australian rust studies. I. Linnean Soc. New South Wales, Proc. **54:** 615–680. 1929.
876. WATSON, I. A. and BUTLER, F. C. Resistance to barley leaf rust (*Puccinia anomala* Rostr.). Linnean Soc. New South Wales, Proc. **72:** 379–386. 1947.
877. WEBSTER, O. J. Inheritance and linkage relations of factors for plant height and spike density in a cross between *Hordeum deficiens nudideficiens* and Club Mariout. Thesis (MS), Univ. Neb. 42 pp. 1940. [Typed]

878. ————. Genetic and morphologic studies of rachis internode length in barley. 1949. [Typed]
879. WEICHSEL, G. Polyploidie, veranlasst durch chemische Mittel. Insbesondere Colchicinwirkung bei Leguminosen. Züchter **12**: 25–32. 1940. [Abs. Resumptio Genetica **14**: 527]
880. WELLENSIEK, S. J. [On the genetics and phylogeny of barley.] Vijfde Jaarboekje Nat. Comite voor Brouwgerst, Wageningen 1940: 83–94. 1940. PBA **17**: 200.
881. WENTZ, J. B. U. S. Dept. Agr., Yrbk., p. 343. 1936.
882. WERTZ, E. Über die Abhängigkeit der Röntgenstrahlenwirkung vom Quellungszustand der Gewebe, nach Untersuchungen an Gerstenkörnern. Strahlentherapie **67**: 309–321, 536–550, 700–711; **68**: 136–164, 287–302. 1940.
883. WESTON, W. A. R. D. *et al.* A disorder of barley ears in East Anglia 1947. Jour. Min. Agr. **54**: 417–421. 1947.
884. WEXELSEN, H. Linkage of a quantitative and qualitative character in barley. Hereditas **17**: 323–341. 1933.
885. ————. Quantitative inheritance and linkage in barley. Hereditas **18**: 307–348. 1934.
886. WHITE, F. H. and BURNHAM, C. R. Chromosome translocations in barley. Am. Soc. Agron., Crops Div., Ft. Collins, Col., p. 45. 1948. [Abs.] [Mimeo.]
887. WHITE, V. B. Glutathione in plant tissues. Science **71**: 74–76. 1930.
888. WIEBE, G. A. Albinism in barley. Jour. Hered. **15**: 221–222. 1924.
889. ————. Complementary factors in barley giving a lethal progeny. Jour. Hered. **25**: 273–274. 1934.
890. ———— and SMITH, L. The multiple occurrence in nature of the sterile generic cross *Hordeum-Sitanion*. [Partially prepared ms.]
891. WIGGANS, R. G. A classification of the cultivated varieties of barley. Cornell Univ. Agr. Exp. Sta., Mem. 46: 365–456. 1921.
892. ————. Variations within and between morphological varieties of oats and barley. Cornell Univ. Agr. Exp. Sta., Mem. 94. 35 pp. 1925.
893. WILSON, J. H. The hybridization of cereals. Jour. Agr. Sci. **2**: 68–88. 1907.
894. WINFIELD, J. N. Regeneration in decapitated coleoptiles of barley. Leeds Phil. & Lit. Soc., Sci. Sect., Proc. **4**: 352–358. 1946.
895. WOLCOTT, E. Influence of x-radiation on stem and leaf anatomy. Jour. Col.-Wy. Acad. Sci. **2**(2–3): 34–35. 1937. [Abs.]
896. WOODWARD, R. W. Inheritance of melanin-like pigment in the glumes and caryopses of barley. Jour. Agr. Res. **63**: 21–28. 1941.
897. ————. Linkage relationships between the allelomorphic series B, B^{mb}, B^{e}, and A_1a_1 factors in barley. Jour. Am. Soc. Agron. **34**: 659–661. 1942.
898. ————. The I^h, I, i allels in *Hordeum deficiens* genotypes of barley. Jour. Am. Soc. Agron. **39**: 474–482. 1947.
899. ————. The inheritance of fertility in the lateral florets of the four barley groups. Agron. Jour. **41**: 317–322. 1949.
900. ————. Sterility in Velvon barley and its relationship to yield, kernel weight, and date and rate of seedling. Agron. Jour. **41**: 430–434. 1949.
901. YAMAMOTO, S. and MEGURO, T. [Analysis of genes in barley. I. Inheritance of ecological characters.] Kihara Inst. Biol. Res., Rept. **1**: 46–64. 1942. [Japanese]
902. YAMAMOTO, Y. [Cytogenetics of barley.] Kyoiku-Nogei **8**(9): 1–7. 1939. [Japanese] [Review provided by R. Takahashi]
903. YAMAZAKI, Y. Investigation on the embryo-transplanting in cereals. Jap. Jour. Genet. **13**: 139. 1937. [Abs.]

904. ————. [Embryo-transplanting as a method of genetico-physiological investigation in cereal plants.] Proc. Crop. Sci. Soc. Japan **9:** 382–389. 1937. [Japanese]
905. ————. [Studies on the transplantation of the embryo in some cereals.] Jap. Jour. Genet. **13:** 323–324. 1938. [Japanese] [Abs.]
906. ————. [Investigation on the embryo-transplanting in cereals. I. Method of embryo-transplanting.] Proc. Crop. Sci. Soc. Japan **11:** 511–521. 1940. [Japanese]
907. YASUDA, S. On the winterhardiness of barley. I. On the relation between the winterhardiness and the monosaccharose content. Jour. Sci. Agr. Soc. Japan **288:** 486–493. 1926. [Reviewed in *22*]
908. ————. On the winterhardiness of barley. II. Effect of potassium salts. Jour. Sci. Agr. Soc. Japan **295:** 273–281. 1927. [Reviewed in *22*]
909. ZADE, A. Experimentelle Untersuchungen über die Auswuchsneigung als Sorteneigenschaften des Getreides. Zeits. Zücht. A. Pflanzenzücht. **18:** 212–222. 1933.
910. ZEINER, W. Das Verhalten verschiedener Sommergerstenkreuzungen hinsichtlich der Anfälligkeit für *Ustilago nuda*. Zeits. Zücht. A. Pflanzenzücht. **17:** 229–264. 1932.
911. ZHUKOVSKY, P. M. Awnless six-rowed barley from Cilicia. Bull. Appl. Bot., Genet. & Pl. Breed. **19**(*2*) : 67–68. 1928. [Russ. with Eng. sum.]
912. ZIEGENBEIN, G. Arbeitsweise und Erfolge in der Hafer- und Gerstenzüchtung an der Pflanzenzuchtstation der Universität Halle. Kühn-Archiv **60:** 440–454. 1943.
913. ZIEGLER, A. Variationen in der Form der Basalborste. Missbildungen und Abänderungen am Typus und deren Vererbung. Ill. Landw. Zeit. **40:** 237–238. 1920.
914. ————. Untersuchungen über die Basalborste der zweizeiligen Gerste. Dissertation München. 1911. [Cited by Aufhammer 39]
915. ZWOBODA, A. Über Vererbung des Saugkraftvermögens bei Sommergerste. Fortschr. Landw. **6:** 241–243. 1931.

ADDENDA TO BIBLIOGRAPHY

ÅBERG, E. Barley and wheat from the Saqqara pyramid in Egypt. Ann. Royal Agr. Coll. Sweden **17:** 59–63. 1950.
ATANASOFF, D. and JOHNSON, A. G. Treatment of cereal seeds by dry heat. Jour. Agr. Res. **18:** 379–390. 1920.
BELL, G. D. H. The breeding of two-row winter-hardy barley. Jour. Agr. Sci. **34:** 223–238. 1944.
BERGAL, P. Contribution à l'étude des lodicules ou glumellules de l'orge *H. sativum* Jess. Compt. Rend. Acad. Sci., Paris **208:** 828–831. 1939.
————. Sur la valeur taxonomique des lodicules ou glumellules de l'orge (*Hordeum sativum* Jess.). Compt. Rend. Acad. Sci., Paris **224:** 489–491. 1947.
————. Les lodicules et leur utilisation dans la systématique du genre *Hordeum*. Ann. Sci. Nat. XI Bot. **9:** 189–269. 1948.
———— and FRIEDBERT, L. Essai d'identification des orges cultivées en France. Ann Epiphyties et Phytogénétique **6:** 157–306. 1940.
BEVER, W. M. Effect of light on the development of the uredial stage of *Puccinia glumarum*. Phytopath. **24:** 507–516. 1934.
BLARINGHEM, L. L'amelioration des crus d'orges. Soc. d'Encourag. Cult. Orges Brass., France. 288 pp. 1910.
BORTHWICK, H. A. *et al.* Effect of photoperiod and temperature on development of barley. Bot. Gaz. **103:** 326–341. 1941.
BRENCHLEY, W. E. The development of the flower and grain of barley. Jour. Inst. Brew. **26:** 615–632. 1920.

BRÜCHER, H. and ÅBERG, E. Die Primitiv-Gersten des Hochlands von Tibet, ihre Bedeutung für die Züchtung und das Verständnis des Ursprungs und der Klassifizierung der Gersten. Ann. Royal Agr. Coll. Sweden **17:** 247–319. 1950.

BYSTRIKOV, V. The root system of cultivated plants-competitors. Bull. Appl. Bot., Genet. & Pl. Breed. **27** (5): 71–111. 1931. [Russ. with Eng. sum.]

CALDECOTT, R. S. The influence of heat treatments on the injury and cytogenetic effects of X-rays on barley. Thesis (PhD) Wash. State Coll. 1951.

CHRISTENSEN, J. J. and GRAHAM, T. W. Physiologic specialisation and variation in *Helminthosporium gramineum* Rabh. Minn. Agr. Exp. Sta., Tech. Bull. 93. 40 pp. 1934.

COVAS, G. Observaciones sobre la sistemática del genero Hordeum. Revista Argent. Agr. **16:** 173–177. 1949.

————. Observaciones sobre la taxonomia de *Hordeum vulgare* L. y formas relacionadas. Revista Argent. Agr. **17:** 73–77. 1950*a*.

————. Hibridación interespecifica en Hordeum. I. *H. compressum* × *H. stenostachys*. Revista Argent. Agr. **17:** 78–82. 1950*b*.

————. El prototipo de las cebadas cultivades. Ciencia e Investigacion **6:** 236–237. 1950*c*.

DITTRICH, W. *et al.* [Biological radiation effects of fast electrons on germinating barley.] Strahlentherapie **80:** 17–34. 1949. [German] Nuclear Sci. Abs. **4:** 2509.

DOSDALL, L. Factors influencing the pathogenicity of *Helminthosporium sativum*. Minn. Agr. Exp. Sta., Bull. 17. 47 pp. 1923.

FAVRET, E. A. Herencia de la resistencia a *Erysiphe graminis hordei* en cebada (3ª parts). Ciencia en Investigacion **5:** 481–482. 1949.

————. Mutaciones inducidas con formaldehida en cebada. Revista Argent. Agr. **17:** 260–262. 1950.

GASSNER, G. and STRAIB, W. Untersuchungen über den Einfluss der Mineralsalzernährung auf die Anthocyanbildung an jungen Gerstenpflanzen. Ang. Bot. **19:** 225–245. 1937.

GÄUMANN, E. Pflanzliche Infektionslehre. 611 pp. 1946.

GENAU, A. Untersuchungen über die Anfälligkeit verschiedener Sommergerstensorten für *Helminthosporium gramineum* auf dem Wege der künstlichen Infektion. Kühn-Archiv **19:** 303–351. 1928.

GOODSPEAD, T. H. The temperature coefficient of the duration of life of barley grains. Bot. Gaz. **51:** 220–224. 1911.

GRANT, M. N. and MCCALLA, A. G. Yield and protein content of wheat and barley. I. Interrelation of yield and protein content of random selections from single crosses. Canad. Jour. Res. C. **27:** 230–240. 1949.

GUSTAFSSON, Å. *et al.* The effects of electrons, positrons and α-particles in plant development. Hereditas **36:** 419–444. 1950.

———— and NYBOM, N. The viability reaction of some induced and spontaneous mutations in barley. Hereditas **36:** 113–133. 1950.

———— *et al.* Chlorophyll factors and heterosis in barley. Hereditas **36:** 383–392. 1950.

HAGBERG, A. and TJIO, J. H. Cytological localization of the translocation point for the barley mutant erectoides 7. Hereditas **36:** 487–491. 1950.

HAMMARLUND, C. Zur Genetik, Biologie und Physiologie einiger Erysiphaceen. Hereditas **6:** 1–126. 1925.

HANSON, W. D. and KRAMER, H. H. The determination of linkage intensities from F_2 and F_3 genetic data involving chromosomal interchanges in barley. Genetics **35:** 559–569. 1950.

HENDERSON, M. T. Studies of sources of resistance and inheritance of reaction to leaf rust, *Puccinia anomala* Rostr., in barley. Thesis (PhD), Univ. Minn. 45 pp. 1945. [Typed].

HERN, E. R. The inheritance of agronomic characters in barley. Iowa State Coll. Jour. Sci. **23**: 39–40. 1948. [Abs.].

HONECKER, L. Resistenzzüchtung an Gerste; züchterisches Testament des Regierungsrates. Zeits. Pflanzenzücht. **28**: 85–89. 1949.

ISENBECK, K. Die Bedeutung der Faktoren Temperatur und Licht für die Frage der Resistenzverschiebung bei verschiedenen Sommergersten gegenüber *Helminthosporium gramineum*. Kühn-Archiv **44**: 1–54. 1938.

KAPLAN, R. W. Einfluss tiefer Temperatur au die Röntgenstrahlen-Mutationsraten von ruhenden Gerstenkörnern. Naturwiss. **34**: 316–317. 1947.

————. Chromosomenmutationen als Ursache der Sterilitätseffekte nach Röntgenbestrahlung von Gerstenkörnern. Zeits. Ind. Abs. Ver. **83**: 203–219. 1949.

————. Chromosomen- und Faktormutationsraten in Gerstenkörnern bei verschiedenartigen Quellungsbehandlungen oder Kälte während oder nach der Röntgenbestrahlung sowie bei Dosisfaktionierung. Zeits. Ind. Abs. Ver. **83**: 347–382. 1951.

KARPECHENKO, G. D. Theory of distant hybridization. Theoretical basis of plant breeding. I. 1935.

KOPECKY, C. Employment of micrometric methods for investigation of barley grains. Sbornik Cesk. Akad. Zemed. **1**: 225–285. 1926.

LASSER, E. Der Einfluss von Licht und Jarowisation auf den Befall von Weizen, Hafer und Gerste durch *Tilletia, Ustilago* und *Helminthosporium*. Kühn-Archiv **44**: 161–210. 1938.

MATSUMURA, S. *et al.* Mutations in barley induced by X-rays. I. Rept. Kihara Inst. Biol. Res. **4**: 22–30. 1950. [Jap. with Eng. sum.].

MECHELKE, F. Ein Fall natürlicher Triploidie und vereinzelter Ringchromosomenbildung bei *Hordeum spontaneum* Koch. Zeits. Ind. Abs. Ver. **83**: 442–446. 1951.

MIÈGE, E. and GRILLOT, G. La staurogamie des orges cultivées (1). Origine de quelques espèces. Bull. Soc. Sci. Nat. Maroc. **13**: 143–155. 1933.

MOH, C. C. and SMITH, L. An analysis of mutants (spontaneous, atomic bomb-radiation-, and X-ray-induced) in barley and durum wheat. Genetics [In press].

MOSTOVOJ, K. I. A contribution to the morphology of the inflorescence and branching of the cereals, especially of the barley. Vestnik Cesk. Akad. Zemed. **7**: 1–6. 1931. [Czech with Eng. sum.].

NAGAO, M. and TAKAHASHI, R. [Genetics of barley. Selection of books on biology No. 2]. 92 pp. 1946. [Japanese]

NAKAO, S. The divergence of floristic composition of barley varieties in Japan and Tibet. Saiensu **1**: 65–69. 1947. [Jap. with Eng. sum.].

————. On the waxy barleys in Japan. Rept. Kihara Inst. Biol. Res. **4**: 111–113. 1950. [Jap. with Eng. sum.]

NISHIKADO, G. *et al.* [Studies on the resistance to diseases in barley varieties. I. Differences between varieties in resistance to mildew]. Agronomic Researches **38**: 141–151. 1949. [Japanese]

NYBOM, N. Studies on mutations in barley. I. Superdominant factors for internode length. Hereditas **36**: 321–328. 1950.

————. Do X-rays resuscitate heat-killed seeds? Hereditas **36**: 516. 1950.

OINUMA, T. Maturation division in some wild barley species. Jap. Jour. Genet. **25**: 20. 1950. [Japanese] [Abs.].

ONO, T. Studies on polyploid barley. Jap. Jour. Genet. Sup. **2**: 75–77. 1949. [Jap., with Eng. sum.].

OSTLER, R. D. Inheritance of rachis length in crosses of accordion rachis. Thesis (MS), Colo. A. & M. College. 1949.

PAPE, R. Neue Erkenntnisse und experimentelle Befunde über die Wirkung kleinster Röntgendosen. Radiol. Austriaca **4**: 35–51. 1951.

POEHLMAN, J. M. A simple method of inoculating barley with loose smut. Phytopath. **35**: 640–644. 1945.

RIDDLE, O. C. and BRIGGS, F. N. Inheritance of resistance to scald in barley. Hilgardia **20:** 19–27. 1950.

ROBERTSON, D. W. *et al.* A summary of linkage studies in barley III. [In press].

RUSSELL, R. C. The whole embryo method of testing barley for loose smut as a routine test. Sci. Agr. **30:** 361–366. 1950.

SARASOLA, J A. and CAMPI, M. D. Reaccion de algunas cebadas con respecto a *Rhynchosporium secalis* en Argentina. Revista Inv. Agr. **1:** 243–260. 1947.

———— *et al.* Reaccion de algunas cebadas con respecto a *Erysiphe graminis hordei* en Argentina. Revista Argent. Agr. **13:** 256–276. 1946. [Spanish with Eng. sum.].

SCHALLER, C. W. Inheritance of resistance to loose smut, *Ustilago nuda*, in barley. Phytopath. **39:** 959–979. 1949.

SCHIEMANN, E. Die neue Nomenklatur der Getreidearten. Züchter **19:** 322–325. 1949.

SHANDS, H. L. and ARNY, D. C. Stripe reaction of spring barley varieties. Phytopath. **34:** 572–585. 1944.

———— and SCHALLER, C. W. Response of spring barley varieties to floral loose smut inoculation. Phytopath. **35:** 534–548. 1946.

SIEBURTH, L. R. Effect of (presumably different) oxygen concentrations in germinating seeds of barley on the biological effects of X-rays. Northwest Sci. **25:** 48–49. 1951. [Abs.].

SMITH, H. S. The inheritance of seed color in the cross *Hordeum Intermedium Cornutum* × *Hordeum distichon nudum*. Thesis (MS), Colo. A. & M. College. 1940.

SMITH, L. *et al.* The relation of oxygen concentration in barley seeds to the biological effects of X-rays. Genetics **35:** 692. 1950. [Abs.].

SMOLAK, J. The results of experiments in the control of stripe disease, helminthosporiosis, of barley. Vestnik Cesk. Akad. Zemed. **2:** 1124–1128. 1926. [Czech with Eng. sum., p. 1198].

SPRAGUE, R. Rootrots and footrots of cereals in Washington. State Coll. Wash. Agr. Exp. Sta., Pop. Bull. 192. 18 pp. 1948.

STRAIB, W. Über die Gelbrostanfälligkeit und -resistenz der Gerstenarten. Arb. Biol. Reichstanst. Land. & Forstw. **21:** 467–481. 1935.

————. Die Bestimmung der physiologischen Rassen des Gerstenzwergrostes *Puccinia simplex* (Kcke.) Erikss. u. Henn. Arb. Biol. Reichsanst. Land. & Forstw. **22:** 43–63. 1936.

SUNESON, C. A. Effect of barley stripe, *Helminthosporium gramineum* Rab., on yield. Jour. Am. Soc. Agron. **38:** 954–955. 1946.

————. Survival of four barley varieties in a mixture. Agron. Jour. **41:** 459–461. 1949.

————. Physiologic and genetic studies with the stripe disease in barley. Hilgardia **20:** 29–36. 1950.

SUSKIND, S. R. Resuscitation of heat-inactivated seeds by X-radiation. Jour. Hered. **41:** 97–102. 1950.

SYAKUDO, K. Inheritance of the awn length and the quantitative function of the causal genes in their length determination in barley, *Hordeum sativum*. Contr. Pl. Breed. Lab. Kyoto Univ. 83 pp. plus appenda. 1947. [Jap. with Eng. sum.].

————. Studies on the quantitative inheritance (4). B. Barley (*Hordeum sativum*) (a). Inheritance of the awn length and the quantitative function of the causal genes in their length determination. I. On the quantitative function of the four inhibitors and the genes N_1, N_2 and M. Jap. Jour. Genet. **23:** 85–90. 1948. [Japanese]

TAKAHASHI, R. Studies on the classification and the geographical distribution of the barley varieties. III. Inheritance of the coleoptile length and its significance for the breeding. Proc. Crop. Sci. Soc. Japan **18:** 44–47. 1946. [Jap. with Eng. sum.].

————. [Studies on the geographical differentiation of the cultivated barley. I. On the articulation of rachis]. Jap. Jour. Genet. **24:** 93–94. 1949. [Japanese] [Abs.].

———— and YAMAMOTO, J. Studies on the classification and the geographical distribution of the Japanese barley varities. XI. Smoothness of awns and width of outer glume. Agronomic Researches **38:** 157–160. 1949. [Japanese]

———— and ————. Studies on the classification and the geographical distribution of the Japanese barley varieties. X. Variations in awns. 2. Agronomic Researches **38:** 152–156. 1949. [Japanese]

———— and ————. Studies on the classification and the geographical distribution of barley varieties. XII. On the pigmentation of the plant parts. Agronomic Researches **39:** 25–32. 1950*a*. [Japanese]

———— and ————. Studies on the classification and the geographical distribution of barley varieties. XIII. On the adherence of the palea. Agronomic Researches **39:** 32–36. 1950. [Japanese]

———— *et al.* Linkage studies in barley. Agronomic Researches [In press] 1950. [Eng. sum. provided by R. Takahashi].

TAPKE, V. F. Studies on the natural inoculation of seed barley with covered smut *Ustilago hordei*. Jour. Agr. Res. **60:** 787–810. 1940.

————. Further studies on barley powdery mildew *Erysiphe graminis hordei*. Phytopath **39:** 505. 1949. [Abs.].

———— and BEVER, W. M. Effective methods of inoculating seed barley with covered smut, *Ustilago hordei*. Phytopath. **32:** 1015–1021. 1942.

TASUGI, H. On the pathogenicity of *Typhula graminum* Karsten. Jour. Imp. Agr. Exp. Sta., Tokyo **1:** 183–198. 1930. [Jap. with Eng. sum.].

THOMPSON, K. F. *et al.* The mutagenic effect of radiophosphorus in barley. Hereditas **36:** 220–224. 1950.

THREN, R. Kritische Versuche zur Resistenzprüfung der Gerste gegen Flugbrand (*Ustilago nuda*) Jens. Kellerm. et Sw. Kühn-Archiv **44:** 211–231. 1938.

TSCHECHOW, W. P. and KARTASCHOWA, N. N. Karyologische Veränderungen der Keimwurzeln nach Röntgenbestrahlung von trockenen Gerstensamen. II. Vorläufige Mitteilung. Strahlentherapie **49:** 238–250. 1934

TSUCHIYA, T. [On a hypo-triploid barley]. Jap. Jour. Genet. **24:** 106–107. 1949. [Japanese] [Abs.].

VALLEGA, J. Reaccion de algunas especies espontaneas en Hordeum con respecto a las royas que afectan al trigo. Revista Invest. Agr. **1:** 52–62. 1947.

WATERHOUSE, W. L. Studies in the inheritance of resistance to rust of barley. II. Royal Soc. New South Wales, Jour. & Proc. **81:** 198–205. 1948.

WEAVER, J. C. American barley production. A study in agricultural geography. 115 pp. 1950. [Mimeo.].

————. Inheritance and linkage relations of factors for plant height and spike density in a cross between *Hordeum deficiens* Nudideficiens and Club Mariout. Thesis (MS), Univ. Nebraska, 1940.

WEBSTER, O. J. Genetics and morphology of rachis internode length in barley. Thesis (PhD), Univ. Minn. 1950.

YAMASAKI, Y. [Studies on the grafting in cereals. II. Grafting of the embryo between common wheat and barley.] Jap. Jour. Genet. **25:** 38–39. 1950. [Japanese] [Abs.].

YU, T. F. and HWANG, L. Varietal resistance and susceptibility of foreign barleys to *Helminthosporium gramineum* Rabh. Nanking Univ. Coll. Agr. & Forestry Bull. **41.** 8 pp. 1935. [Eng. with Chinese sum.].

———— *et al.* Varietal resistance and susceptibility of foreign barleys to covered smut *Ustilago hordei* (Pers.) K. & S. Agr. Sinica **1:** 83–90. 1934.

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